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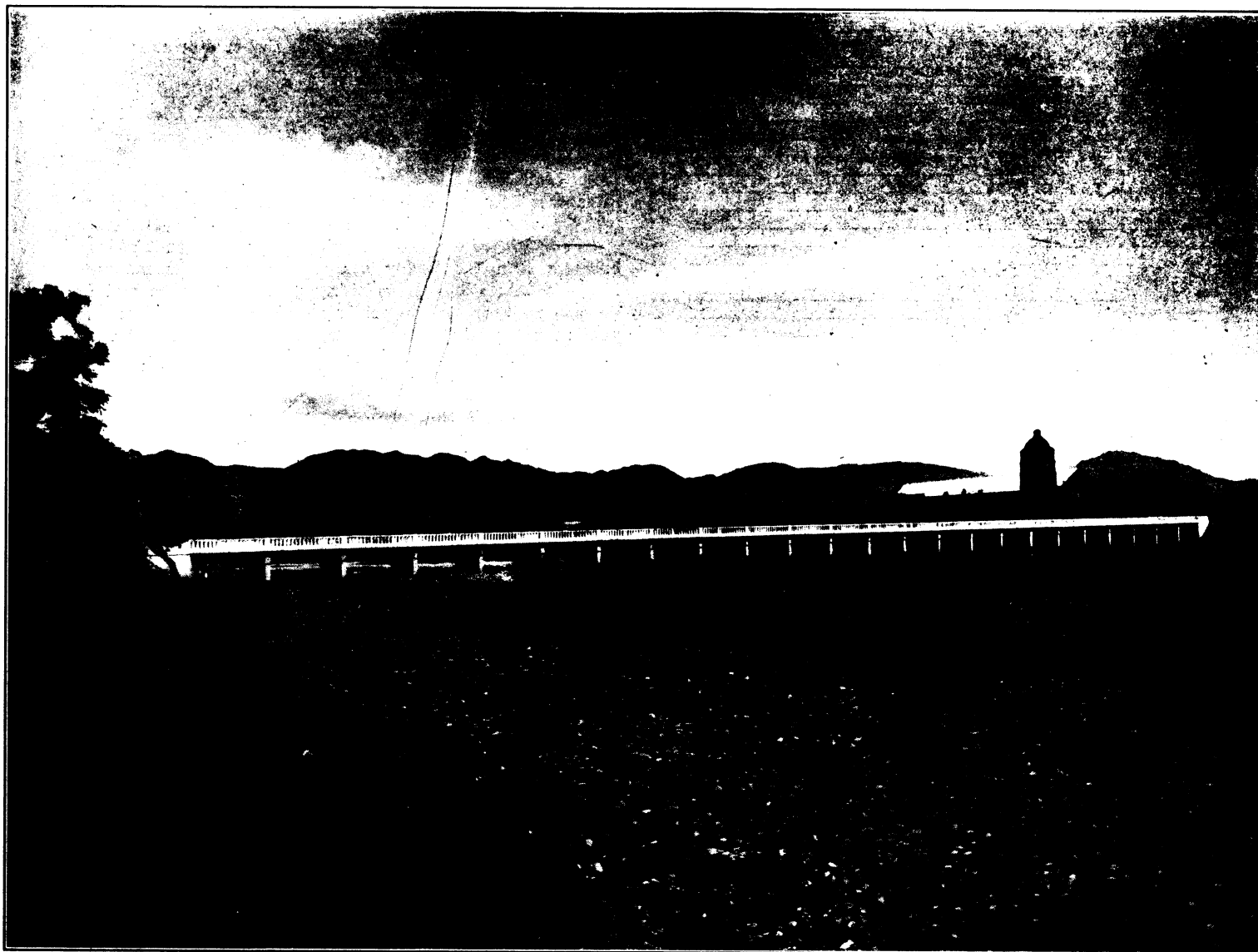


Quarterly Bulletin

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No. 3



QUARTERLY BULLETIN

BUREAU OF PUBLIC WORKS
MANILA, P. I.

ISSUED QUARTERLY BY
THE PROVINCIAL DIVISION, UNDER THE DIRECTION OF
THE DIRECTOR OF PUBLIC WORKS

C. A. TANSILL, COMPILER

The objects of the QUARTERLY BULLETIN are:

1. To show each engineer and employee of the Bureau of Public Works the work of the Bureau as a unit.
2. To show him that his work is a unit part of the whole.
3. To make clear to every provincial and municipal official and to the people the work being done by the Bureau.
4. To make the work of the Bureau of personal interest to all.

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POPULARIZING THE BUREAU.

Our greatest asset.—The greatest asset of this Bureau is the good will of the public. This good will is the absolute foundation of our success as a Bureau. Without it our work will drag, halt, and finally end in confusion. With it, we can leave a monumental record in the history of these Islands.

The public.—The public of these Islands is composed of 8,000,000 Filipinos, several hundred thousand Chinese, and some thousands of Americans and foreigners. The varying elements of this public have different characteristics and their good will and confidence must be gained in different ways, but it is united in the desire that the taxes it pays for public works be spent to the best advantage.

Its good will.—The public's good will rests on confidence in the work done by the Bureau and on liking and respect for its men. Unless the Bureau is popular and respected, appropriations are grudgingly

granted, local officials do not coöperate, and the general public is quick to deride the smallest shortcomings in the management of the Bureau.

How created.—This good will is created by two things—efficient work by the Bureau and a popular personnel—and both are necessary. Good work in public works is its own justification to the engineering profession and eventually to the public; but public recognition of the same is enormously accelerated if the engineers and employees are likeable men, well thought of in the community, and on cordial and friendly terms with Americans, Filipinos, and foreigners.

The men we want.—The kind of man we want is alert, capable, energetic, enthusiastic, companionable. A man of clean ideals and a "good sport" in the right and not the wrong sense of the word. A man whose enthusiasm for life in general and his work in particular are contagious; who is on genial terms with his associates, official and others; who believes that public works are one of the greatest needs of the Islands; who makes other people believe the same; whose treatment of the public is always courteous and considerate; who leaves rudeness and insolence to the other fellow; who is thoroughly in sympathy with the people he is working among; and who convinces everybody that he is striving heart and soul to make every peso for public works go as far and do as much as possible.

The kind of men we do not want.—We do not want the pessimist, the grouchy, disgruntled cuss, the fellow who always knows more than his chief, who whines about favoritism and "pull," forgetting that the man who gets results is always the favorite in a live organization and that the kind of "pull" he complains about is usually spelled "p-u-s-h" and also "p-u-n-c-h." Also, we do not want the man who is not in sympathy with the Filipinos and who is temperamentally unsuited to hold a position in a government whose fixed ideal is the welfare and advancement of the Filipinos. The public-bet damned business man and public official should be as extinct in modern American life as witch burning or the divine right of kings to misrule. Unfortunately, we are not altogether rid of him in the Bureau of Public Works, although he is getting scarce. Wherever he still exists he is a blot on the pay roll and awaiting the eraser. A change of heart or a change of job are his only alternatives. The man who defies or exasperates the portion of the public with which he comes in contact is a traitor to the Bureau, for he is estranging the public which pays our pay roll and on whose good will the Bureau depends.

The spirit we want.—The spirit we want is that of an up-to-date business firm thoroughly sympathetic with the modern trend of ideas—a firm which is soliciting public patronage and knows that its prosperity rests on public approval. Our attitude toward the public must be that of a business man toward a best customer or a lawyer toward his most important client. We have engineering and administrative talent for sale; the public of the Islands has hired our services and we cannot show it too great consideration. The attitude of some of our men in the past would have lost the entire trade of a prosperous business house in a week. It is the kind of attitude that no longer has any place in the Bureau. The policy of this Bureau in regard to relations with the public is definite and fixed and men not in sympathy therewith and not prepared to carry out both the letter and the spirit of the same are not wanted.

Warwick Greene

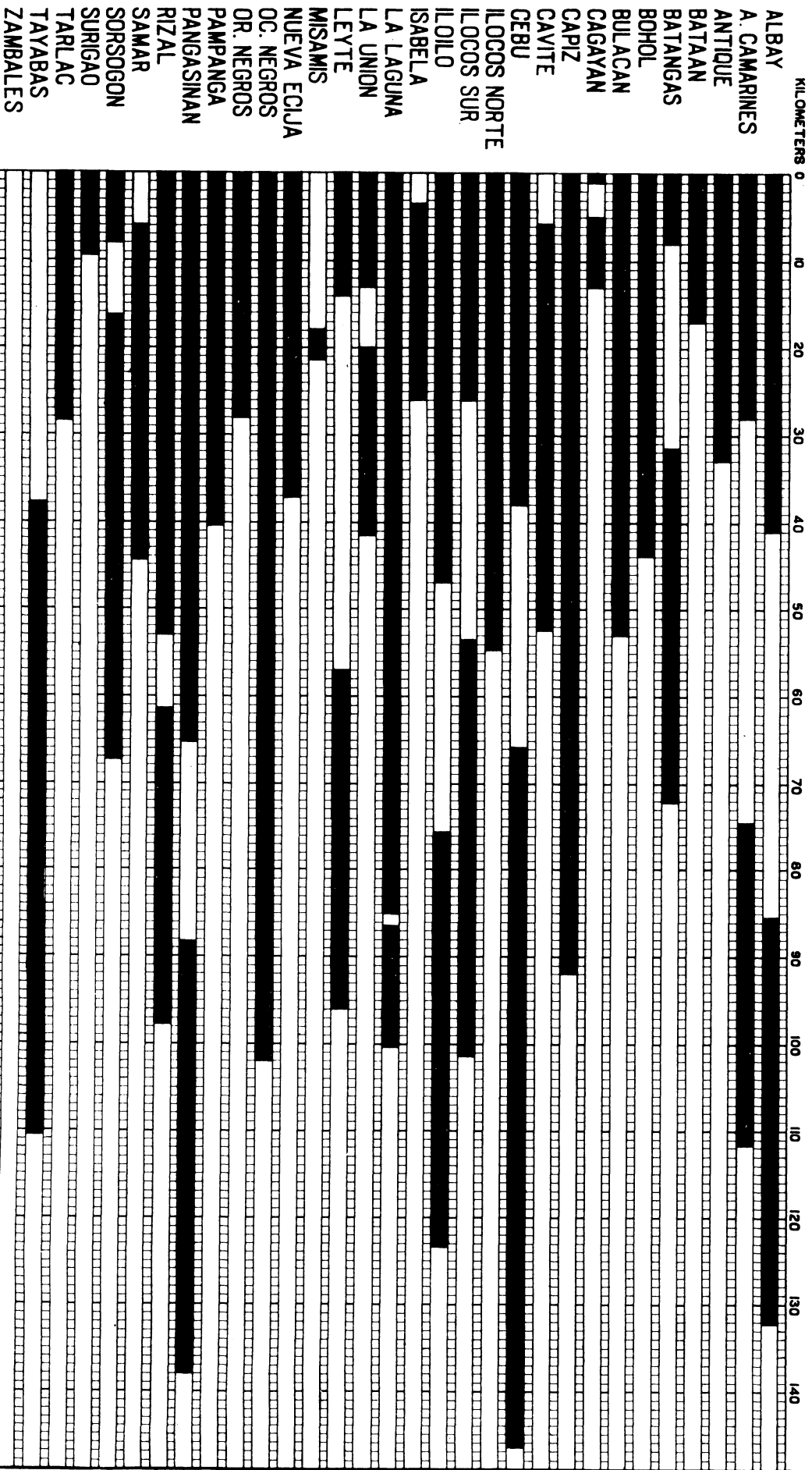
THE ENGINEER'S WORKING TOOLS.

By W. H. WAUGH, Division Engineer, Member American Society of Civil Engineers,
Member of Philippine Society of Engineers.

No matter how favorably an engineer may be located, certain standard technical books of reference are necessary for general and everyday use. Without such references and authorities a man is not able to meet conditions which are continually coming up in his prac-

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tice. He is not only working under a severe handicap, but he is not developing or extending his field of usefulness to the limits that he should.

Every engineer should have a good technical library within reaching distance. This library need not contain a vast number of volumes and it is not necessary to go to a great deal of expense to secure an assortment of useful books which will remain standard for many years to come.

The engineer's technical schoolbooks, lectures, and notes will form the best kind of a foundation for a working library. Among the best books to reinforce such a foundation are the following:

Merriman's Civil Engineers Pocket Book.....	10.00
Trautwine's Civil Engineers Pocket Book.....	10.00
Kidder's Architects and Builders Pocket Book.....	10.00
Kent's Mechanical Engineers Pocket Book.....	10.00
Gillette's Handbook of Cost Data.....	10.00
Searle's Field Engineering or Nagle's Field Manual of Engineering..	6.00

These books cover the general field of civil engineering in a very thorough manner. They should be found in every engineer's possession and should occupy a space on his desk. No matter how many other books he may be fortunate enough to possess, he will find the above the most useful. The cost of the entire set is \$56, which provides about 8,000 pages of good, solid data and information.

The engineer's working library should by no means be limited to the foregoing list of references and handbooks. Other works should be added according to requirements and "available funds for the project."

Baker's Roads and Pavements (650 pages, price \$10) is a valuable work and can be studied with much profit by engineers engaged on road work. Masonry Construction by the same author (730 pages, price \$10) has long been the standard book on this subject. While it treats mostly of cut-stone masonry, a great many general principles are brought out which should be studied and marked down for future reference. The latest editions have valuable chapters on reinforced concrete. Taylor and Thompson's Concrete, Plain and Reinforced, is one of the best books on the subject (785 pages, price \$10).

Gillette's Rock Excavation, Methods and Cost (300 pages, price \$6) and his Earth Work and its Cost (240 pages, price \$4) are two books worthy of special mention. The engineer will find a great many hints and suggestions on grading and quarrying that will pay good dividends when put into practice.

Every engineer should have a good working knowledge of the law of contracts. Johnson's Engineering Contracts and Specifications (560 pages, price \$7) is highly recommended. It gives a good synopsis of the law of contracts and many examples illustrating general and technical clauses usually found in engineering specifications and contracts. About 400 pages are devoted to specifications of various and well-known pieces of construction work. Wait's Engineering and Architectural Jurisprudence is regarded by both the engineering and legal profession as the standard work on the law of construction (828 pages, price \$13). The law of contracts, by the same author (346 pages, price \$6), is extensively used as a textbook in the leading technical schools. It is an excellent work but does not go into the subject as deeply as the first-mentioned book by Wait.

The engineer who is specializing in any particular line should secure the latest works on his chosen specialty. A good way to do is to order a good standard book every month. By this plan the cost will not be felt.

One or more of the leading engineering periodicals should be taken and read by every engineer who desires to keep up with the rapidly advancing times. The transactions of the well-known technical societies are probably the best organs of up-to-date and approved practice obtainable. Government, State, school, and manufacturers' bulletins contain a great deal of highly valuable information and they may be secured at little or no cost.

For estimating purposes, United States prices and work accomplished per unit will be useful to a certain extent for comparisons; but their greatest value will consist in giving the engineer an idea of the cost and particulars of certain structures with which he is not familiar. They will also be valuable in suggesting items which might otherwise be omitted from an important estimate.

The district engineer's practice is one which is unusually diversified, and he is being called upon continually for estimates and supervision of all sorts, kinds, and conditions of work. Often it is a difficult, if not an impossible, matter for him to do more than hazard a guess as to the best means or methods. With a good working library he will not only do much better for himself, but he will add greatly to his value and to his efficiency.

CONCRETE PILE BRIDGE CONSTRUCTION.

By FRANK T. JAMES, C. E., of the contracting firm of Allen & James.

[See title page for Osmeña Bridge over Cabugao River, Manila-North Road, Ilocos Sur Province.]

Up to about four years ago, in the designing of reinforced-concrete slab and girder bridges, the customary practice had been to specify a substructure consisting of solid abutments and piers to be set depths below water to insure safety against damage by scour. This type of foundation in most cases requires in the course of construction a deep excavation, sheet piling or a cofferdam, and a pumping outfit—assuredly a fairly expensive procedure. Hence, when engineering practice established the fact that a cluster or line of concrete piles driven to a sufficient depth and properly spaced would develop sufficient bearing power to carry the loads usually specified, requiring a deep footing—and in many instances a spread footing—bridge designers of the Bureau of Public Works sought to adapt reinforced-concrete pile construction to conditions in the Philippine Islands. This type would eliminate the necessity for making and pumping out deep excavations and the placing of large amounts of concrete necessary for the footings—usually from two-thirds to three-quarters of the total cost of the unit span of the bridge, a circumstance often lost sight of when one casually compares the known cost of a completed bridge with that of the part of the structure readily presented to his view.

The result was that the plans for many of the new bridges designed thereafter showed a substructure consisting of bents of (usually) five reinforced-concrete piles capped with a block of concrete, itself reinforced in a manner to tie all the piles together in such a way as to make the five piles act as one in supporting the load placed upon them. Although it developed that, generally, the safe length of span of reinforced slabs and girders to place on this type of pile bent is about 8 meters, in lieu of the 10 and 12 meter spans used on solid piers, more of the shorter spans of the new type may be constructed to make up a given length of bridge, with a saving of cost and time. The latter item is often an important one in the case of a bridge over a very wide river and in a section of the Islands where the working season is short, and the former the criterion upon which the choice of design most often depends. In this case it is one warranting a departure, in many instances, from the customary practice then obtaining in the Bureau of Public Works.

As is usual with men of experience in their chosen work when proceeding with anything new, the engineers took care to recommend this pile type of bridge for only places where there existed bountiful assurance that piles might be driven to a point where sufficient bearing pressure would develop with a penetration in the ground usually specified for wooden piles under foundations. This requirement is an effective length of 5 or 6 meters.

Most of these new bridges have been built by contract and the writer has been engaged for the past three years in the construction of those awarded to his business associate and himself, so what he is setting forth here comes from actual experience in handling the work and a full knowledge of circumstances and conditions.

On our first construction project of this type, after the pile was properly centered for the location called for on the plans, we lowered the hammer on to the cushion and the pile settled about a meter or more into the sandy mud of the river bottom. By this time the pump was running in proper working shape and we gradually lowered a jet of water down two opposite sides of the pile to a point about a meter beyond the point of the pile itself. By lifting and dropping the jets through a distance of about 6 inches we soon had a steady flow of water coming up along the faces of the pile next the jets, carrying the sandy mud with it. The weight of the hammer forced

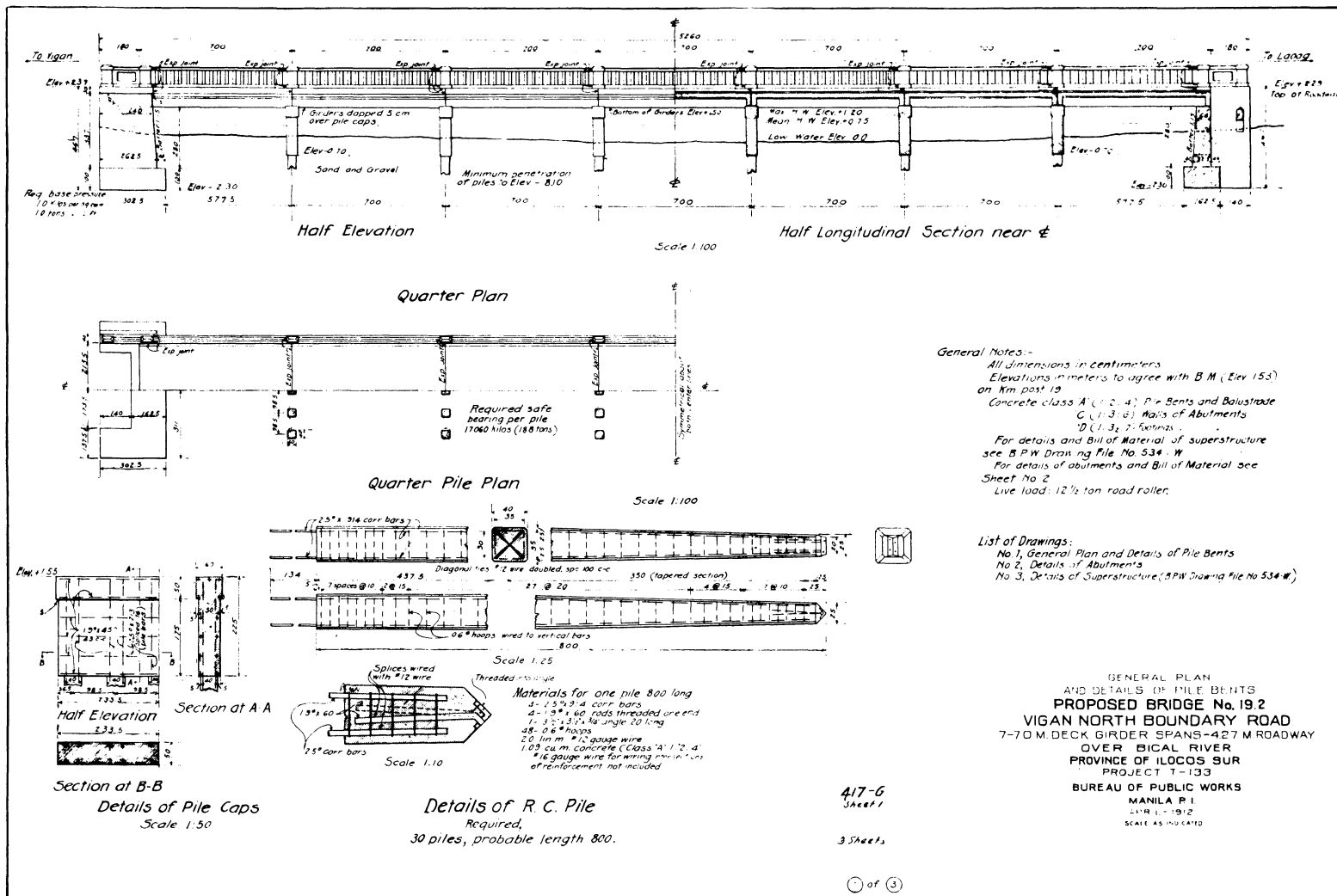
the pile further down (nearly to the end of the jets) and a bit to one side away from the center. By jetting around the pile on the other two faces we loosened the material there and the pile, under a very light blow of the hammer, slid back into a good center at the same time that it penetrated farther into the ground, which was harder at that point than the mud above it.

By this process of jetting for a few minutes all around the pile and then hammering with short blows until the penetration was so slight as to require jetting again, we got the pile down nearly to grade and then determined the bearing power. Striking six blows of about 4 meters and noting the penetration for same, we applied the Engineering News formula for wooden piles, and finding the result obtained showed the required bearing, pulled off the iron cap and moved the driver for the next pile. The head of the first pile had shattered about 20 centimeters down, but this was considered of

pile would shove it sufficiently out of the way to permit of driving our new pile to a greater depth. But this did not yield favorable results and we resorted to simply hammering the concrete pile with a view to driving it through the log.

We succeeded in getting about a half meter more penetration when the pile refused to go another bit and yielded to the hammering by shattering about a meter from the top, so we were ordered to stop and try the next pile. It is very probable that there was other debris under that first log or that it was of molave or similar wood which did not readily split, but served to wedge the concrete pile against the hard ground back of it, and which we had not loosened, knowing that the pile would slide too far out of line of the bent to serve any purpose.

Just about this time the elation of the two Government engineers present changed to real concern, for here, right on top of the most



no account and all hands present felt elated with the ease and rapidity with which the new type of foundation bid fair to be constructed. It had taken us about three hours and a half to raise the pile and drive to a point accepted as satisfactory by the district engineer, who was present during the whole process.

Pile No. 2 went to grade satisfactorily and a little more quickly, because we jetted considerably deeper and longer before placing the pile in position. But pile No. 3, when about two-thirds down, brought up against something hard and through which the jets would not go. By the little chips of wood which came up after we had thumped the obstruction with the end of the jet a few times, we knew it was an old pile from an earlier bridge and that it had fallen on its side and buried under the silty deposit of the river.

This was too far down to crab out so we tried jetting around the log and tapping the pile with the hammer in hopes that the concrete

satisfactory performance of the first two piles, arose a most distressing circumstance, and it was with much anxiety that these gentlemen watched the progress of the jets when we ran them down about 6 meters into the places for the two remaining piles in the bent. They felt relieved when there appeared no indications of obstructions to satisfactory driving of the next two piles, but began to "take a look see" at the remaining six bents still to be driven. Well, they found all that they were looking for in the shape of old masonry abutments fallen and buried beneath the river bed, at the location of three of the bents. It was thus necessary to take steps toward getting this stuff out of the way or to chip out holes through it, where not too thick, and to dynamite where it would do no damage to the new abutments which were built while the concrete piles were yet green and ripening. All this entailed additional expense to the province and an indirect loss to the contractor as the early floods later in the

season were a source of damage to him because he had been delayed just a little too long in preparing the way for driving the piles into the obstructions, which after all proved an unsatisfactory procedure in the end.

And now, the point which I wish to make right here, seems to me to be the one real feature controlling the whole question of choice as between a reinforced-concrete pile bridge or some other design, and that is: What sort of information was furnished when the data sheets were submitted for the bridge location, and what kind and how thorough soundings were made and included in these data?

If a sufficient number of proper soundings had been made, do you suppose that the designing engineers would have located those bents exactly in the middle of fallen masonry of a previous structure, knowing that they were so deep and so thick that holes could not be dynamited through them without tearing out the whole countryside, when it would have been entirely feasible to have increased the lengths of part of the spans or perhaps put in one span less in the bridge and increased them all—still within a safe length?

To cite another instance, if proper soundings had been sent in with the survey sheets there would not have been the necessity later during construction for cutting off nearly half the length of over two-thirds of the piles in the bridge and the first floods of the next wet season would not have left the bridge in the precarious position that it did. An inquiry into the matter brought forth the following questions:

Where is the record of soundings?

Who made these soundings? Did he know how to do that class of work?

Was he a man who had the interests of the Government at heart (notice, I do not say his own), and how did he make these soundings?

To state it in a few words, all the distressing circumstances arose from the fact that the soundings were taken from an assumed elevation indicated on the information sheet as zero, and that when the plans were drawn up this zero, because not otherwise designated, was taken to be the elevation of low water. Well, we cut off about 3 meters of these piles because we could not drive them through the hard stratum encountered in the river bed, nor even into it, for the piles at that time had no iron shoes on the points. And so had there also been an old bridge there at the time soundings were taken, about 3 meters or so above low-water level offering additional obstructions. Do you glean the gist?

Through these experiences we all have learned. Better soundings were taken for the bridges projected shortly after these first trials, steel shoes or angles were specified for the points of piles, and where a hard material was known to exist as the only objection to placing a pile bridge at that site, the same was dynamited out long before the contractor brought his plant to the job or began any new work.

Soon after this we began work on a job requiring the driving of a large number of concrete piles, and in the usual manner started to put the jets down for the pile and encountered a material which clogged the jet a meter or two down. It proved to be a very coarse gravel cemented together by stiff clay and sand, and in its turn forming a sort of unstable conglomerate with the "niggerheads" or boulders which, upon excavation for each bent, we found existing below the stream bed as well as on top of it and along the river banks. This information obtained at a depth of 6 meters, as subsequently developed.

Now, I firmly believe that no idea ever entered the minds of the designing engineers that they were calling for concrete piles to be jetted into such material or they would have made some provision for it. But they had made none, and when it became apparent that attempts at jetting into that material were bringing very unsatisfactory results and that the piles would have to be hammered into place, new borings or soundings were made in a proper way and at intervals across the wide stream bed to ascertain just what was the real consistency of the material for the first 6 or 7 meters below low water. Mind you, orders sent out to make borings after the piles were all cast, the driver and engine all in readiness to drive those piles, and the rainy season only about six months off—which meant that whatever bridge was to finally be put there had to be put in right off or go over until the next year, involving legal difficulties, claims, etc. So we kept at it trying to find a means of getting these piles down

to a reasonably safe depth and finally decided on excavating a pit about a meter deep for each bent and then hammering the pile to refusal or shattering it to a point below the elevation of the bottom of the cap.

Plate No. I, Lapog Bridge, Ilocos Sur, in process of construction, shows how the pile heads shatter and the bars bend all out of shape when being driven into the material mentioned above. These piles were cast full length of the bars.

After such shattering of the pile, the cap must be taken off, the broken concrete cleaned out, the head of the pile leveled off, the reinforcing bars oftentimes cut, and then the cap replaced, repacked, and rammed before driving again—a long, tedious, time-wasting process for the sake of perhaps an inch or two more penetration, for when a pile begins to shatter it is because it is "bringing up" at the point, and not necessarily because the pile may have a defect.

On another contract the soundings taken at one bridge site did not tally to any great degree of reliability with the borings made by the contractor necessary to get the piles to a safe point below scour—borings made with a pick and shovel 6 meters deep, 5 meters long, and a meter wide. In one instance the data on the plan called for sand between certain elevations—over 2 meters difference—and it was sand (?) which sparked when struck into with a pick or crowbar and came out in chunks as big as a man's head.

In this material, the jet, which was a single length of 2-inch pipe

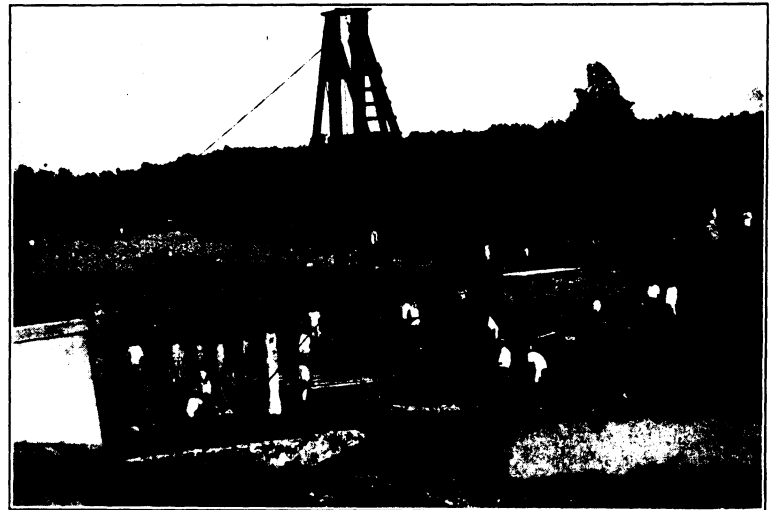


Plate No. I. Lapog Bridge, Manila-North Road, Ilocos Sur Province.

playing into a working nozzle 2 feet long reducing to three-quarters of an inch, working at a pressure at the nozzle of about 100 pounds per square inch and a capacity of 100 gallons a minute, availed nothing at all, and with 56 blows of a 3,000-pound hammer falling an average of $3\frac{1}{2}$ meters after the pile had already penetrated about 30 centimeters into the material, we got an additional penetration of only 2 centimeters. Fancy requiring piles to be driven, to say nothing of jetted, through that stuff at a depth of anywhere between 4 and 5 meters below the surface of the ground, when, with only a foot of the pile subjected to the frictional action of the material, it practically stood still under the hammering noted above. After removing this pile and blasting with black powder, we drove it again to satisfactory penetration and almost unlimited bearing.

The use of powder proved so satisfactory that we drilled holes and blasted out for the three piles in the bent remaining to be driven.

In these last two instances it was clearly demonstrated that the samples of material brought up by the water jet rig in one case and the boring auger outfit in the other were not reliably indicative of the form in which the particles brought to the surface in sounding actually existed in the ground and river bed. We do not deny that the man who made the soundings in the latter case got sand of some sort as a sample, but there was no indication on the data sheet that it was a solid mass of sand, small gravel, and clay firmly bonded together.

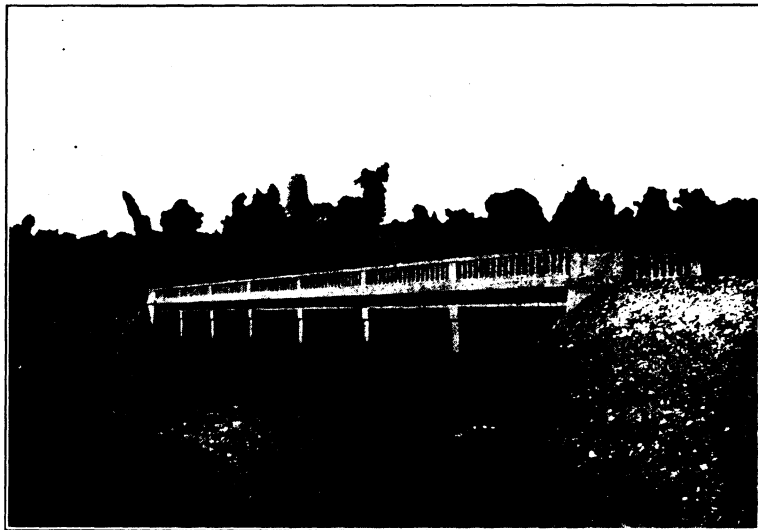


Plate No. II. Bical River Bridge, Manila-North Road, Ilocos Sur Province.

All this simply means that, with the heavy pumping equipment required for concrete pile structures to be moved to inaccessible and remote places, a type of bridge other than that of concrete pile should be specified for sites when conditions like these obtain. Hence it comes down to a case of accuracy in preliminary investigations.

You must by no means assume that it is an invariable rule that information of doubtful veracity is furnished for all contemplated work in the Philippine Islands, but it has simply been the writer's experience (and regretfully so, too) that in only four of fifteen instances where he has been responsible for the proper driving of a very large number of concrete piles has the information furnished corresponded with that actually obtained during construction. In the others work not contemplated in the contract had to be done to get the piles down to a safe depth.

Where soundings have been made in stream beds consisting only of mud, sand, or some such material, and where from the beginning

it was evident that the task at hand was merely to see how far the jet would go with no unusual effort at getting it down, information galore has obtained. But when it required considerable care in the operation, and more care in interpreting the action of the sounding tool and the sample procured, there has appeared an indifference to the real purpose of the test.

With the sincerest of motives the writer has put these views forward and likewise wishes to impress upon his readers, most of whom are engineers probably, that from his point of view a fair solution of the problem would come if—

First. A competent engineer is detailed to superintend personally, on the ground, the taking of the soundings.

Second. He use a little judgment in combining the action of the boring outfit when penetrating each successive interval with the material he gets as samples, and note the consistency of the stratum.

Third. He make at least one sounding for each bent or cluster of piles, and if a platting of results shows likelihood of change of strata, make sufficient additional tests to follow it out.

Fourth. He check the data sheet as prepared for forwarding to the central office with the field notes, and see that no error has been made in transferring the information.

To my notion the kind of soil existing at a bridge site should largely influence the type of design. Muddy, sandy, and sand with loose clay strata readily admit a pile driven with jet and hammer; data of sand, gravel, and soft clay, if not too deep, offer some resistance, but not a bothersome one, to the jets; but attempts at jetting into a river bed composed of nothing but gravel and little sand, with the idea of displacing the gravel at depths of 5 or 6 meters, are successful rarely, while strata soft, plastic, and hard clay underlying a stratum of hard resistant material like gravel and clay yield little or none to the action of jets. The condition often found of clay cropping out at about a meter above a proper elevation for the point of the pile—this elevation determined, of course, by the class of material above the clay and to what extent it would scour—is an admirable one of which to take advantage, for though the jets may not work successfully in the clay, it is possible to hammer about a meter or more into it and thus obtain absolutely complete frictional resistance and an absolute bond between the pile and the clay contiguous to it.

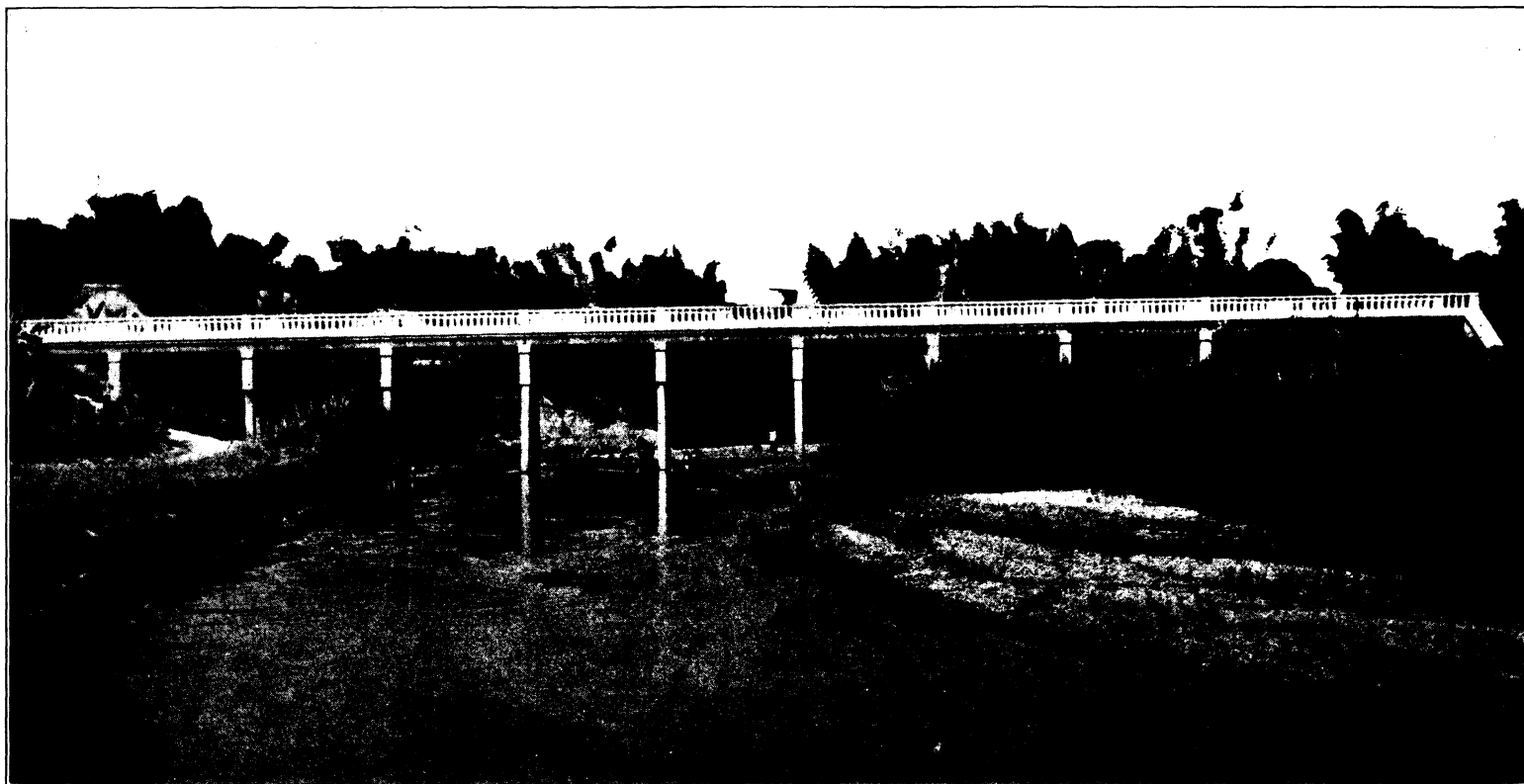


Plate No. III. Maasim Bridge, over Maasim River, Bulacan Province.

From the difficulty experienced in driving concrete piles in some places it would appear that a pile bridge is not adapted to every kind of stream and certainly not to every class of soil. Of course, in choosing the type of bridge for a certain site, there are certain determining features to consider, and from these it is my opinion that pile bridges are best adapted for use in tidewater streams of any number of spans; at sites upstream some distance from tidewater if the banks are fairly well defined but not too high and where there is little or no fall between the water at the site and the sea (such as the Cabugao River, see cover page, and the Bical River, Ilocos Sur, see Plate No. II), and over a slough or across swampy country. This design should not be considered for locations back in the foothills where the rivers rise quickly after a heavy rain and carry downstream considerable drift in the shape of bamboo, trees, etc., unless it is possible to get the bridge high enough to escape damage from such drift, without requiring piles so long that they cannot meet the requirements for which they were designed. Plate No. III shows a structure meeting this requirement satisfactorily.

When desiring to drive piles into compact clay, gravel, and sand, with the sand predominating, but hard and resisting the action of the jets, a generous charge of black powder placed at approximately the elevation of the point of desired penetration for the pile will loosen the material well and permit of easy driving. A hole may be drilled with an ordinary churn drill, a stick of bamboo filled with powder for the full length of the hole to make the cartridge.

To drive through layers of "finger" or "pit" coral, or any other similar cemented material, blast out holes with dynamite, using two caps, and two fuses to insure explosion, otherwise it will cost considerably to remove the unexploded charge.

The equipment which we have found necessary for the driving of these reinforced-concrete piles is as follows:

A pile driver with leads about the same length as the longest pile to be driven.

A hoisting engine of the standard type with at least two drums and gypsy heads and not less than 22 nominal horsepower.

A pumping outfit consisting of one large duplex steam pump or, for ease in transporting, two smaller ones of the same total power; a foot valve at the end of 20 feet of suction hose; about 10 feet of discharge pipe immediately leading from the pump; sufficient length of pipe (for the jet itself) to reach to the elevation of minimum penetration of the pile required on the plans; connecting up the discharge lead with the jet, a piece of flexible rubber hose of the same diameter as the discharge pipe; and a nozzle of some suitable design attached to the jet pipe.

A drop hammer of at least 2,000 pounds weight.

Forty-five meters of $\frac{3}{4}$ -inch plow steel cable for the hammer.

One hundred meters of same diameter cable working through single and double diamond sheaves of 12 inches diameter for handling the pile into place.

A driving cap for the head of the pipe made of 1-inch steel plates 4 feet long.

A coil of $1\frac{1}{2}$ -inch diameter manila rope working through 8-inch double blocks, and single snatch blocks, for moving the driver; and 1-inch diameter rope for guys.

The driver should be so designed and have sufficient $\frac{3}{4}$ -inch bolts at all intersections of the superstructure that when completely erected it will be a rigid frame. Otherwise, after lifting a pile up from one side a number of times, the driver will get out of plumb transversely and the joints begin to crack and the material to shear.

Too much stress cannot be laid on the requirement that the leads be erected plumb and at right angles to the longitudinal axis of the sills.

To obtain best results the line of action of the hammer should be the prolongation of the vertical axis of the pile. If the leads are not plumb, the blow of the hammer will tend to shove the pile out of the leads, shatter the head, deliver only a part of its blow in a perpendicular, and by the force of gravity itself tend to go out of the leads, bending the iron channels (running surface of leads) outward, and,

worst of all, soon rack the driver into a condition requiring re-framing and replenishing of pieces of timber where the bolts have sheared them at the ends.

Sills of some hardwood like yacal, dungon, or guiyo are best, and Oregon pine serves admirably for the upper framing, being both light and substantial.

The pumping outfit should deliver water to the jets at pressures, according to the material, ranging from 100 to 200 pounds per square inch at the nozzle, free to the air, and at a capacity of from 100 to 250 gallons per minute. With two Fairbanks-Morse 6 by 4 by 6 inch pumps, having 3-inch intakes and 2-inch discharges, connected in parallel to deliver into the same discharge lead, we have obtained

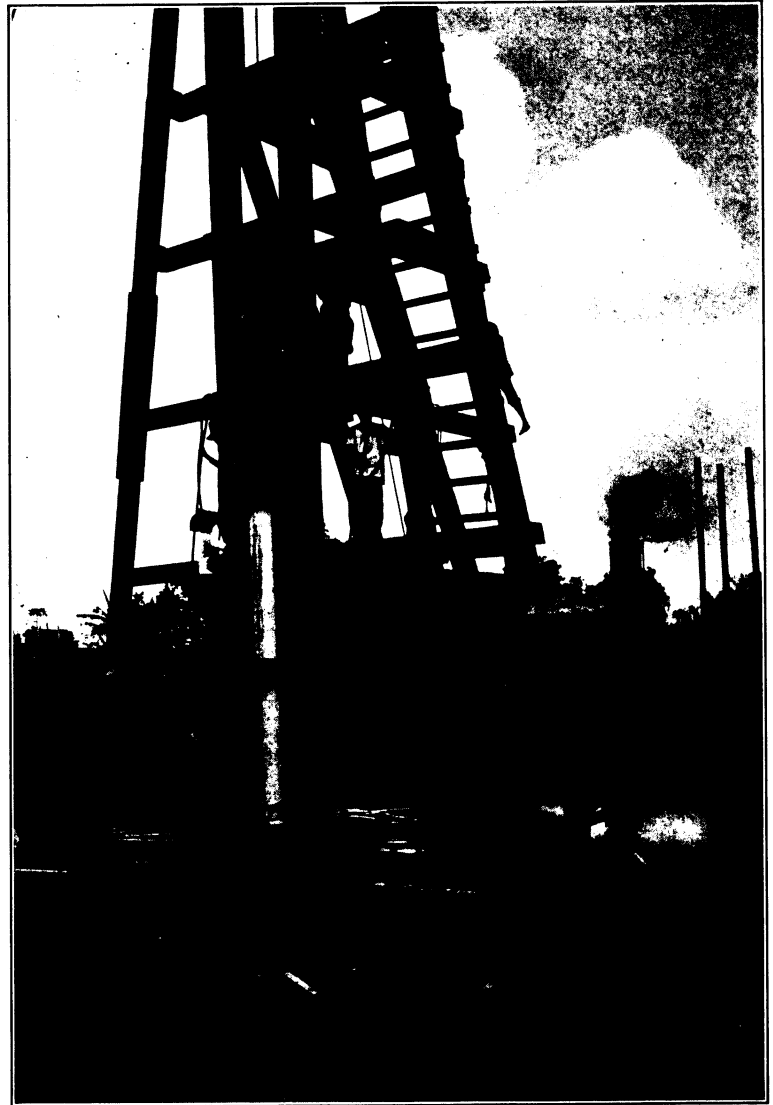


Plate No. IV. Driving reinforced concrete pile, Maasim Bridge, Bulacan Province.

at full-steam admission from the 22-horsepower boiler working to its limit (steam at 125 pounds) the 100 gallons—100 combination. However, for jetting through deep strata of gravel and the clay-gravel formation, this is not enough power and we have purchased a large pump, same make, 8 by 6 by 12 inches, with an intake of 5 inches and a discharge of 4 inches rated to supply 235 gallons a minute at 200 pounds pressure. This pump will require a boiler capacity of about 40 nominal horsepower.

Any reduction in size of pipe from the pump should be made after the water has passed from the flexible hose, as at best the friction losses in hose are great and it is not wise to lose any more pressure and velocity by reduction of diameter there.

Unless too high above the water level for good suction, the pumps are best handled and operated if carried on the sills of the driver back from the leads under the sway braces or "ladder."

The question of proper weight of hammer is an open one. The writer believes that for satisfactory driving and, at the same time, facility of transportation over long distances and rough roads in the "bosque" away from Manila, that a 3,000-pound hammer is best. When it becomes necessary to get a 5,000-pound hammer, as some people believe, then it is time to think twice. Will the material into which you would drive permit the pile to enter without shattering badly in the process, and should, therefore, a pile bridge be recommended for such a location?

When we have cast the piles, with a meter or so of the reinforcing bars protruding after packing the cap, we have lowered a cast-iron follower in the leads, which had short stubs of dunlop pile set into holes in the top and bottom of it. Then we could hammer the pile without striking the bars.

Plate IV shows a pile in process of driving with cap, follower, and hammer in position, just after a blow, and the pumps and jet working at a depth of about 4 meters—or 1 meter below the point of the pile. This is an 11-meter pile and the pieces of 6 by 8 timber in front and behind the leads help to keep it plumb.

The cap is bolted snugly onto the pile with a space about 8 inches deep left above the pile head and this filled with sacking, sawdust, old rope, and a piece of 2-inch lumber immediately on top of the packing and under the bottom strut in the follower.

CONSTRUCTION CAPIZ MARKET AND TIENDAS.

[Standard market plan, open-court type, 28.5 by 43.5 meters; standard tiendas, 4 by 4 meters.]

L. W. SCHEIDEMANTEL, district engineer, Member American Society of Engineers and Constructors.

Bids for the erection of the Capiz market and tiendas were opened August 22, 1912, the Insular Construction Company being the lowest bidder. The amount of this bid being in excess of the funds available, it was decided to do the work by administration, which was authorized September 3, 1912.

Funds available.

Insular loan funds, Act 2083.....	₱30,000.00
Municipal funds	2,000.00
Total funds available	32,000.00

On January 6, 1913, the materials all being on hand, the erection was commenced and May 1, 1913, the market was completed. The tiendas were commenced April 2, 1913, and were completed and turned over with the market to the municipal authorities on August 14, 1913.

Preliminary to the erection of the building it was necessary to prepare and drain the site. This work was commenced August 5, 1912, and terminated January 29, 1913. It embraced the following features and cost:

Capiz market fill and drainage.

Features and subfeatures.	Quantity.		Unit cost.	Total cost.
	Lineal meters.	Cubic meters.		
Fill, complete (rolled)		2,767.5	₱1.399	₱3,863.91
Rolling fill with steam roller		2,761.5	.131	
Material delivered by tram		2,930.0	.367	
Manufacture of 61 centimeters concrete pipe	195		5.569	
Placing concrete pipe drain	193		5.078	
Box drains, 45 centimeters by 45 centimeters	43		9.743	
Miscellaneous box drains	39.9		12.616	
Drainage, complete				4,254.22
Total				8,118.13

Comparative costs.

Item.	Amount of lowest bid.	Cost lowest bid plus inspection and surcharges.	Actual administration cost plus surcharges, inspection, and depreciation of equipment.
Market	₱19,934.00	₱23,646.71	₱17,098.71
Tiendas	12,500.00	14,828.00	6,735.00
Filling	6,973.73	8,180.60	3,863.91
Total		46,664.21	27,697.62
Drainage (not covered in contract proposal)			4,254.22
Total expenditure			31,951.84

The district engineer's original estimate on the cost of the market building was ₱16,395.16. The actual cost was ₱17,098.71, which, however, includes extra work valued at ₱987.85.

The above tabulation is made from cost-accounting records and includes depreciation charges for all equipment, which should be included in administration as well as contract work. The figures used are based on the lowest bid plus 14 per cent surcharge and an allowance of ₱1,500, or 0.04625 per cent for seven months' service of an inspector.

The work was done under the supervision of an American foreman and was also closely directed from the district office.

Statements of expenditures and outstanding obligations.

	Certified expenditures.	Outstanding obligations.	Total.
Miscellaneous	₱742.21		₱742.21
Labor	7,240.47		7,240.47
Material	19,397.20	₱648.05	20,045.25
Surcharges	3,642.80	281.11	3,923.91
Total	31,022.68	929.16	31,951.84
Appropriation			32,000.00
Balance			48.16

The poor bearing soil of the building site made it necessary to prepare special plans for the footings, which were not included in the bids.

Estimate of extra cost for spread footings and extending columns 1.5 meters below footing.

Lumber, 42 board feet for each of 40 columns, 1,680 board feet, at ₱100 per M.	₱168.00
Excavating through fill, 40 holes at ₱0.50	20.00
Driving piling and excavating holes, 40 at ₱1.50	60.00
Concrete, 40 columns 0.3 cubic meter each, 12 cubic meters, at ₱40	480.00
Reinforcing iron, 30 linear feet 3/4-inch square, twisted, per column	104.40
Reinforcing iron, 15 linear feet 3/4-inch square, twisted, per column	6.60
Equipment	20.00
Total	859.00
Surcharges, 14 per cent	128.85
Grand total	987.85

Unit cost data on erection of market building.

Feature.	Unit.	Quantity.	Unit cost.
Roof trusses	Board feet	22,128.00	₱0.181
Structural iron	Kilos	5,373.00	.296
Excavation, dry	Cubic meter	22.00	.463
Class A concrete	do	26.73	31.893
Class C concrete	do	38.38	26.019
Reinforcing, in place	Kilos	4,345.50	.126
Vitrified pipe drain	Linear meter	159.50	2.812
Galvanized-iron roofing and gutters	Square meter	1,080.00	3.855
Concrete floor	do	1,125.00	2.036
Open drain and sidewalk	do	105.75	7.737
Painting	do	1,080.00	.343
Curb, 15 by 75 centimeters	Linear meter	150.00	3.268
Total cost of building			17,098.71

Data on erection of tiendas.

Supervision:		
American foreman		P494.64
Native foreman		43.67
Labor		999.74
Hauling		2.71
Equipment		1,246.24
Material		3,948.00
Total		6,735.00

Itemized labor statement Capiz market and tiendas.

Class labor.	Rate per day.	Days.	Amount.
American foreman	^a P233.33	257½	P2,001.52
Capataz	1.25	26½	33.17
Do	1.20	106½	127.80
Do	1.00	59	59.00
Masons	2.25	6½	14.62
Do	1.20	28½	46.20
Do	1.00	213	213.00
Do .....	.80	8½	6.80
Do .....	.75	22½	16.88
Carpenters	2.00	183½	367.00
Do	1.80	100	180.00
Do	1.75	79½	139.12
Do	1.70	64	108.80
Do	1.60	22½	36.00
Do	1.50	105	157.50
Do	1.40	116	162.40
Do	1.25	128½	160.67
Do	1.20	202½	243.00
Do	1.10	48	52.80
Do	1.00	218½	218.50
Blacksmiths	2.00	1	2.00
Do	1.75	4½	7.87
Do	1.00	131	131.00
Do .....	.85	47	39.95
Do .....	.75	23	17.25
Tinners	2.00	9	18.00
Do	1.50	5	7.50
Do	1.25	16½	20.67
Do	1.20	6½	7.80
Do	1.00	4½	4.50
Enginemen	1.75	14½	25.37
Do .....	.75	14½	10.88
Do .....	.50	9½	4.75
Watchmen .....	.60	147	88.20
Do .....	.50	160	80.00
Laborers .....	.75	54	40.50
Do .....	.70	24	16.80
Do .....	.60	524	314.40
Do .....	.50	3610½	1,805.25
Contract market roof			230.00
Labor in hospital			23.00
Total			7,240.47

^a Rate per month.

In considering the cost of the Capiz market and tiendas, consideration is due the fact that all materials were ordered from the Bureau of Supply, Manila, from where it was shipped to Libas, the port of Capiz, and from Libas it was reshipped to Capiz by barrotos, a distance of 5 kilometers, unloaded on the river bank at Capiz to tramcars, and conveyed to the market site which was distant three-tenths of a kilometer from the river. This involved three handlings and practically double freight.

Some of the difficulties encountered in the work of erection and preparing the site and draining same may be appreciated when taking into consideration the fact that Capiz is situated on a low delta formed by the Panay River, two outlets of which practically surround the town. Capiz formerly was a nipa swamp and remains to-day almost entirely surrounded by a large area of swamp land. The extreme high tides to this day still inundate some of the principal streets of Capiz. A test rig weighing 1,300 pounds placed on the old market site sank of its weight 7.5 centimeters before a load could be placed. While digging a trench for the drain and pipes a sandy loan was encountered near the surface, with water everywhere 30 centimeters below the surface. The sandy loam acted like quicksand—a man placing his foot on the bottom would sink up to his ankles very quickly. The drain employed for the main line consists of 61-centimeter concrete pipe which was laid in a trench of the above-described soil approximately 2 meters deep. Sheet piling, heavily braced, was absolutely necessary to keep the ditch open and even then considerable difficulty was encountered through the soil bubbling up from below. It was necessary to use 61-centimeter pipe on account of the fact that it was desired to drain storm water for a considerable area. Four street culverts and two manholes made it possible to do this.

All roof trusses were framed and built up on the ground and then hoisted to place in the usual manner.

The entire work was directly under the supervision of an American foreman and was constantly under the direct supervision of the district engineer. Results obtained permit the observation that effective supervision pays.

MARKET CONSTRUCTION PROGRAM.

The first market along the lines now accepted was erected in 1908, and the development of such markets was gradual until the beginning



Capiz market, Capiz, P. I.

of 1912 when, through the passage of Act No. 2083 by the Philippine Legislature, sufficient funds became available to make it possible to begin the systematic improvement of municipalities by means of loans.

Practically all market projects are financed by loans granted by the Insular Government on recommendation of the Executive Secretary, one of whose representatives personally inspects each municipality before the loan is granted and recommends to municipal councils the most desirable site available.

The site must contain at least 1 hectare of land, be located as near as practicable to the central part of the town, on a main highway, near the railway station, if any, and when possible, on the bank of an estero navigable by bancas. Good drainage is essential.

Plans for market buildings, when requested from the Consulting Architect, provide for first-class streets on all sides of the site. The principal streets are preferably made 18 and sometimes 20 meters in width, those on the sides being from 12 to 15 meters in width. The land necessary for widening existing streets and for opening new streets is taken from the market site.

January 1, 1913, when collection by administration was directed by the Governor-General, to June 30, 1913, six months, the collections have amounted to ₱70,000 more than the collections by contract during the same period of the preceding year. The continuance of this policy, it is expected, will in three years result in an increase of nearly ₱500,000 over the market collections by contract.

The influence of modern sanitary markets on the public health cannot be set forth in figures, but that a carefully conducted central food-sales depot will be an immediate influence toward the betterment of health conditions in municipalities is apparent.

Loans to municipalities for the purpose of erecting modern markets and for other public works are granted from funds of the Insular Government made available for such purposes by Acts of the Philippine Legislature. They are the insurance fund, created by Act No. 1728, the funds of which cannot be loaned for more than two years; the public works bonds sinking fund, created by Act No. 1729; and the friar lands bonds sinking fund, created by Act No. 1749, the funds in which can be loaned for periods not exceeding five years.



Market construction in Carcar, Cebu.

The Executive Secretary, when writing to the Consulting Architect for plans for market projects, states the type of the central building and tiendas desired, and two or more plans showing different types of buildings and of layouts are usually requested. Municipal councils are given the privilege of choosing the plan desired, but the Executive Secretary recommends the type believed most advantageous.

It is seldom that a municipality is financially able to borrow sufficient funds to erect all the buildings designed to cover the entire market site, and in most cases it will be a number of years before the market is developed to a point where the entire number of buildings planned will be required to care for the needs of the municipality, plans as prepared by the Consulting Architect providing for future extensions as well as for buildings immediately to be erected.

The markets in the *poblaciones* of all municipalities, by direction of the Governor-General under the provisions of Act 1634, are now conducted by administration. Modern markets, as completed, will also be conducted by the municipalities. That the change from collection of market rents by contract to collection by administration proves of financial benefit to municipalities is shown by the fact that from

Loans from these funds are made at 4 per cent per annum. In addition to these funds there may be loaned one-fourth of the gold standard fund, made available for loans to provinces and municipalities for public works and permanent improvements by Acts Nos. 2083 and 2088, effective December 8, 1911, and December 21, 1911, respectively. Loans from this fund may be made for not exceeding ten years at 3 per cent per annum.

In order to provide modern market facilities it usually requires a sum in excess of what can be repaid by municipalities in five years and, in order to permit of a greater number of loans being made for ten years, it is usual to make one-half of each loan from the so-called five-year trust funds, and one-half from the gold standard fund, the ten-year fund, thereby making it practicable to grant double the number of loans for ten years otherwise possible.

Only such loans as an examination of the finances of a municipality shows can be repaid from current revenues, not including anticipated increased market receipts, are granted.

That the results obtained justify the policy is clearly proved. Twelve modern markets are now in operation. The lowest return



Lipa (Batangas) market. (Block of reinforced concrete tiendas, on left, under construction.)

received by a municipality on the money invested is 6.3 per cent; the next lowest is 16.7 per cent, and the other markets earn on the investment 18.8, 26, 26.5, 27, 41.7, 33.4, 43.3, 44.2, and 82.6 per cent.

The last four markets referred to have been in operation more than a year, which would seem to show that at least that time, and probably a longer time, is necessary properly to develop the earning power of a market.

The highest rate of interest charged a municipality is 4 per cent per annum for money loaned for these projects; the lowest rate is 3 per cent and the rate paid on loans granted one-half at 3 per cent and one-half at 4 per cent, repayable in ten equal annual installments, is 3.272 per cent per annum.

In a great number of municipalities where markets are erected or where the erection of markets is contemplated, it is expected that

the increased market receipts will not only pay the principal and interest of the loan granted, but will as well provide a considerable sum for other expenditures in addition to the funds already available.

Experience in the past two years has shown that first-class roads are necessary to the success of a market. It has shown also that the installation of the market tends to develop the district through which a first-class road passes.

Market place developments consist of buildings of three classes: (1) Main market buildings, (2) tiendas with open sides, and (3) tiendas with closed sides.

These buildings have been standardized, this work having been carried on during the past few years and having at present reached what may be considered a satisfactory stage of development. The main market buildings are of permanent construction and consist of

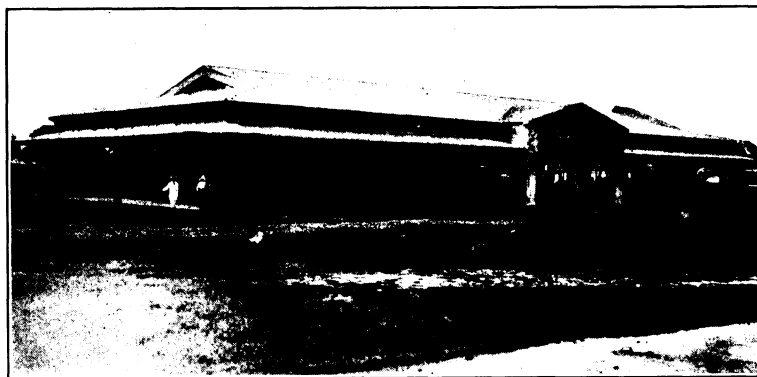


Hagonoy market, Bulacan Province.



Interior view of Hagonoy market at Hagonoy, Bulacan.

one or more longitudinal bays formed by lines of reinforced-concrete columns supporting either trussed or lean-to roof spans. They have a uniform height of eaves above the floor level of 2.90 meters, and uniform projection roof beyond the outside column line of 1.50 meters. This permits all space inside of column lines to be used in any except the most inclement weather. The roof covering is generally of cor-

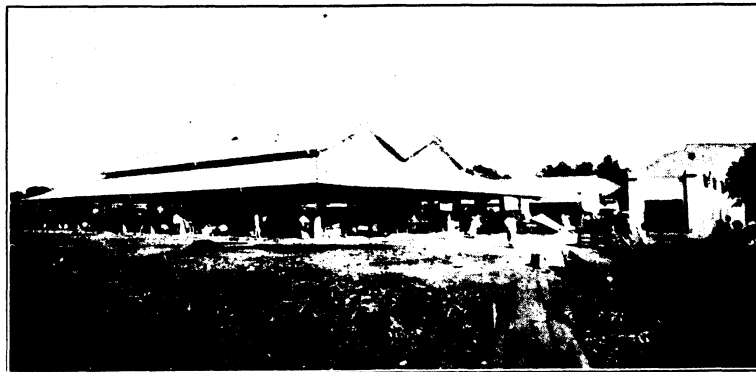


Balayan market, Batangas.

rugated galvanized iron, having a pitch of 25° for main roofs and 20° for lean-tos. A tile roof was used on the San Roque, Cavite, market (30 meters, open-court type) and has proven satisfactory. Other designs will be prepared in the near future. The columns are of reinforced concrete designed to carry the wind pressure as vertical cantilevers and are carried on spread footings. Roof trusses are



Obando market, Bulacan.



San Roque market, Cavite Province.

framed from guijo or other timber even superior to this in lasting qualities and strength, and structural details in general have been given especial attention. The sides of the building below eaves are left open in all standard types of market. Where lean-tos are used, the clerestory wall consists of reinforced concrete with semicircular tile ventilators or of galvanized-iron louvers set between the columns. The floor is made of concrete 10 centimeters in thickness, with a 2-centimeter wearing surface laid on a prepared foundation of gravel. In all cases, whether a present water supply exists or not, pipes are installed to permit flushing of the concrete floor which has a 2 per cent slope from the center of the building to the sidewalk curbs. The necessity for laying the concrete floor in small sections is taken advantage of by making the sections approximately 1 meter square, thus forming a permanent and convenient marking for determining the area occupied by lessees.

The present standards for market buildings fall naturally into series, as follows:

(a) A single bay consisting of two lines of columns supporting the trussed roof with hip ends and having a central monitor extending the full length between hips. This is the smallest and cheapest type used and is illustrated in Obando market. Designs have been prepared for over-all widths of 12, 15, and 18 meters, having, respectively, 9, 12, and 15 meter truss spans.

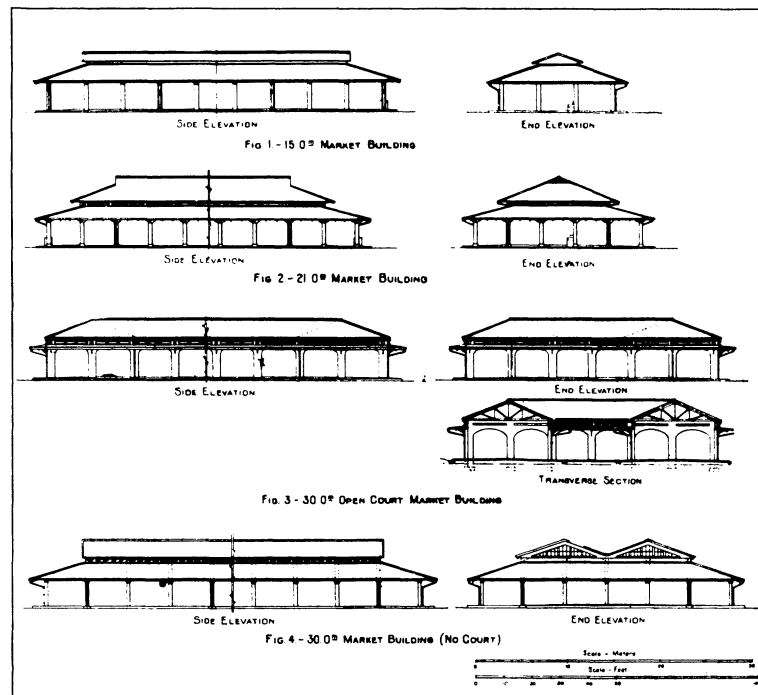


Plate 7.

(b) A central bay having a trussed roof span and two-side lean-to bays, supported on four lines of columns. Lean-to bays are continuous around both ends of the building, thus inclosing the central bay. This type is illustrated in figures 2 and 7 (Lipa, Batangas, market). Designs have been prepared for 21 and 24 meter widths, the central bay in each case being 10.8 meters truss span, between column centers and the lean-to bays, respectively, 3.6 meters and 5.1 meters center of columns, with the usual 1.5 meter projection beyond outside columns. Owing to the increased width of these types, it becomes necessary to provide better ventilation than is possible by merely leaving the sides open, and the height of the main bay is increased to such an extent

meters over-all width, having truss spans over the main bays, 9 meters between centers of columns, and two lean-to bays 4.5 meters in width between centers of columns, and 1.5 meters projection beyond outside columns (San Roque type).

(d) Type consisting of single bays as described under (a), built on four sides of an open court, the transverse section showing four lines of columns. Designs have been prepared for 28.5 meters and 30 meters over all widths, both having 9-meter truss spans over the main bays, with 1.5-meter projection beyond outside column and 7.5 and 9 meters, respectively, width of open court between centers of interior columns. There is a monitor roof on the four wings. Capiz, Capiz, market illustrates this type. A variation of this type consists in the addition of a media agua. This plan has been prepared for over-all widths of 28.5 meters (San Carlos, Pangasinan, type) and 30 meters (Calasiao, Pangasinan), both having 9 meters of trusses over bays between centers of columns and 1.50-meter projection of media aguas and 7.5 and 9 meters, respectively, width of central court between centers of inside columns. Plate 7 illustrates this type. The San Carlos (Pangasinan) market, illustrated in the July, 1913, Bulletin, is an excellent example.

Plate 8 shows transverse sections of all types and sizes for which standard designs have been made.

TIENDAS.

Tiendas are of two types, (1) the so-called Jaro type, which is built with open sides and is intended as a sort of overflow market for occupancy on market days only, and (2) the regular closed type of tiendas, intended for use also upon other business days. Both types of tiendas have been designed in a number of different sizes which are tabulated below:

Open (Jaro type).	Closed.	
	Single.	Double.
Meters.	Meters.	Meters.
4.5 by 5.0	3 by 3	4 by 4
	4 by 4	4 by 5
	4 by 5	4 by 6
	4 by 6	4 by 8

They are built in continuous blocks, the number of units composing a block being variable and depending upon the layout of the market place.

Tiendas are of the lightest possible construction, having timber or concrete columns carrying a light roof of rafter construction covered with flat galvanized iron. One side of each block is closed by means of removable board fronts which may be locked in place while the tiendas are closed. The other side and both ends have a combination shutter and lifting counter which, opened during business hours, forms a sales counter, and closed, forms part of the side. Interior partitions are of tongued and grooved sheathing for about three-fourths of their height, the remaining quarter being filled in with diamond mesh wire screen to provide ventilation; ceilings are of tongued and grooved sheathing. Floors are of concrete, similar to those in market buildings. All tiendas have media aguas extending 1.50 meters beyond the column line, this being the width of the sidewalk usually adopted around markets and blocks of tiendas. Tiendas of 4 by 8 meters size have been provided with living quarters consisting of a 3 by 4 meter room in the rear of the tienda. No other sizes have this provision. The details of tiendas and of market buildings also have been simplified as much as is possible in order to avoid the necessity of securing skilled labor for their construction. Plate 9 shows general elevations of typical blocks of tiendas of both open and closed types.

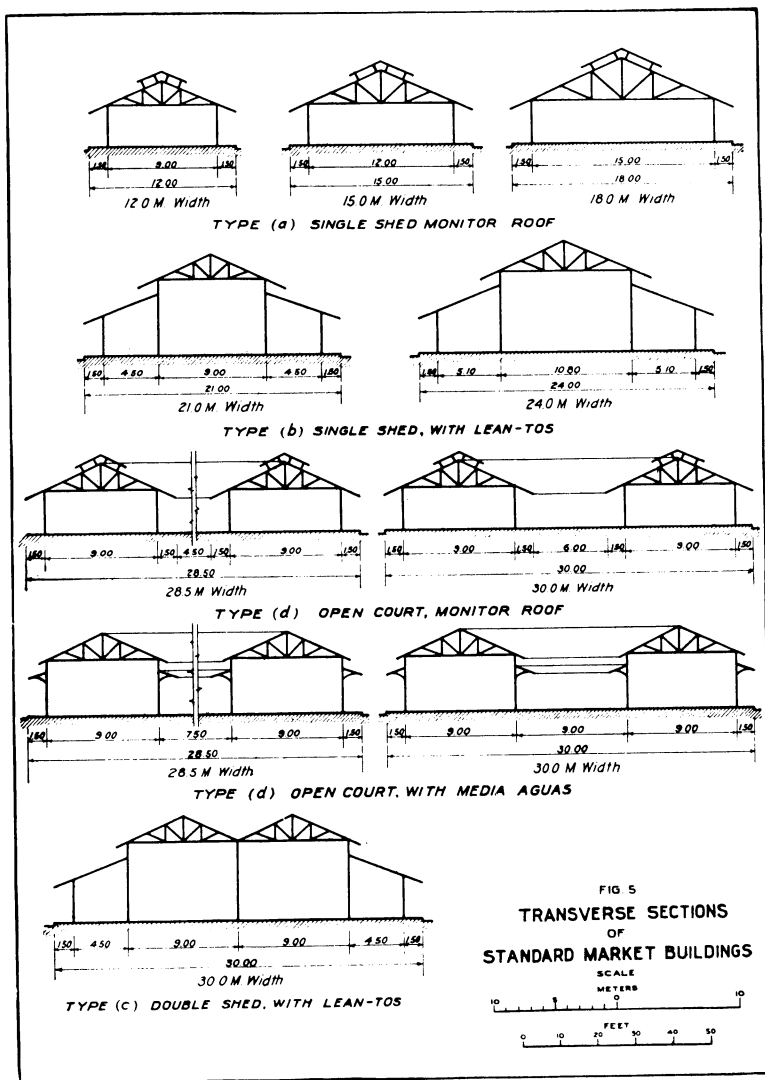


Plate 8.

as to allow ventilation through the clerestory. Two types of clerestory are used, the first consisting of galvanized-iron louvers, set between concrete posts on both sides and ends, the second, a more ornate type, consisting of concrete girders with ventilating openings into which are set red semicircular tile.

(c) Two bays consisting of trussed roof spans supported by three lines of columns (the center columns common to both bays), with a lean-to extending along both sides and ends of the two main bays. The section of this building, therefore, shows five lines of columns. The ends of the main bays are gabled and the clerestory is provided with ventilating openings consisting of galvanized-iron louvers set between the columns. A single design has been prepared for 30

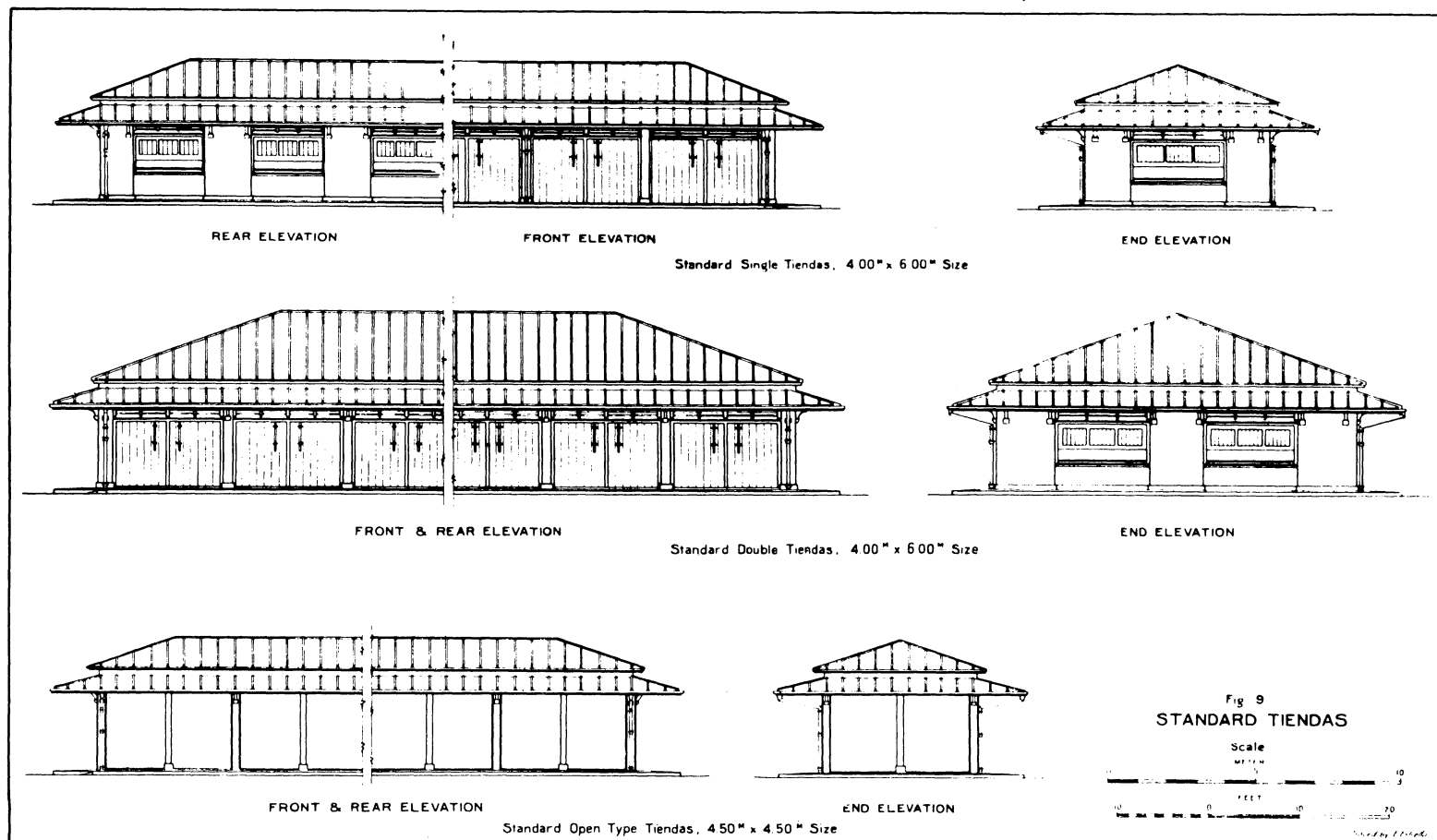


Plate 9.

The scheme usually followed in laying out a market site is a central group of one or more market buildings, with tiendas generally of the closed type, building along street or boundary lines. Where two or more market buildings form part of the development, a block of tiendas is frequently built between the two main market buildings. The arrangement depends upon the location and the demand, both present and prospective, for market space. Typical location plans showing the buildings now proposed and probable future development for Calasiao (Pangasinan), Santa Maria (Bulacan), Pototan (Iloilo), and San Roque (Cavite) are shown in Plate 10.

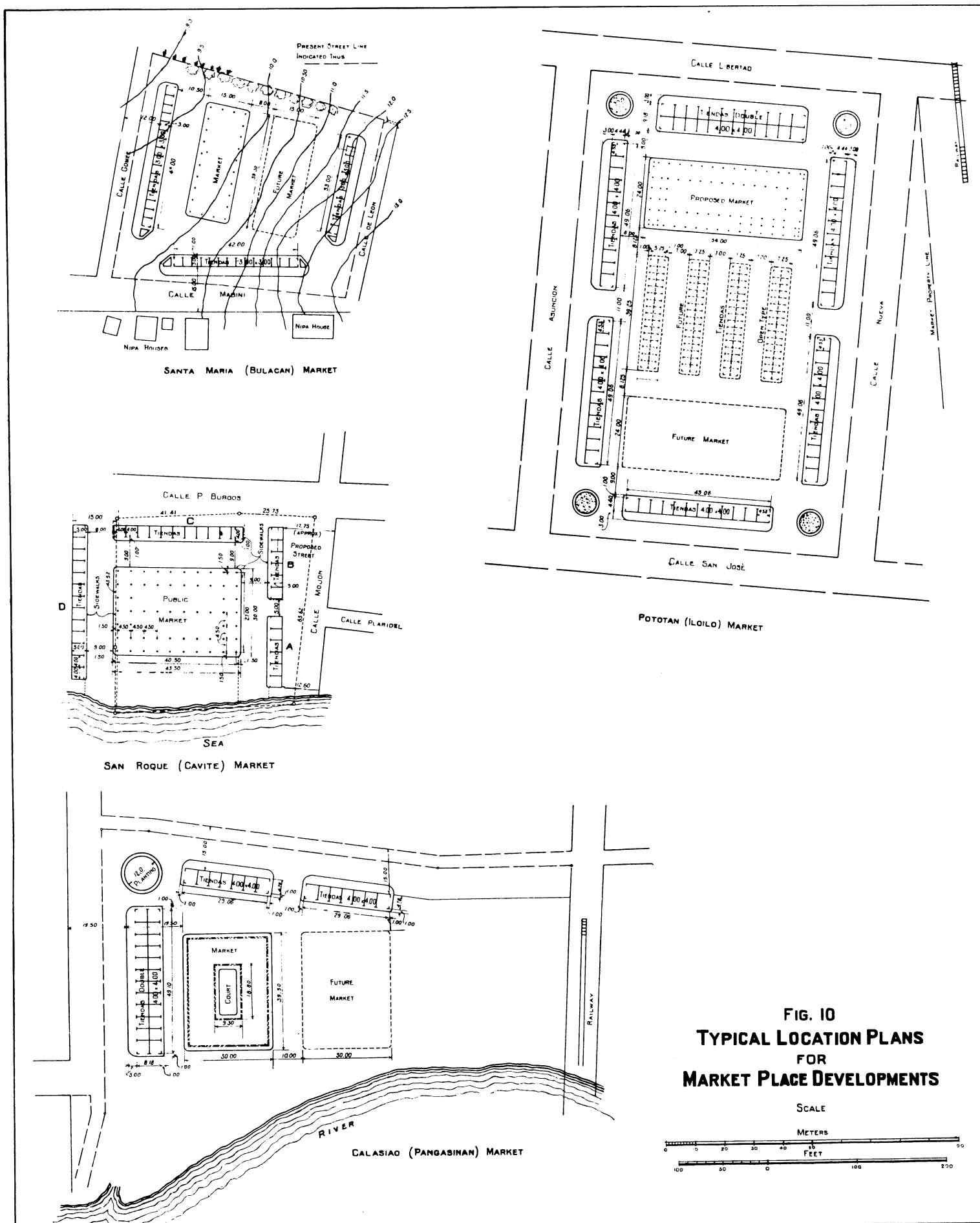
The following table shows the markets completed to September 1, 1913, markets under construction or being advertised, and sources from which funds have been derived to finance the projects:

Markets completed.

Municipality.	Province.	Dimensions of central buildings.	Amount of Insular loan.	Amount of municipal appropriation.
		<i>Meters.</i>		
Lipa	Batangas	21.00 by 43.50	P30,000.00	P5,000.00
Hagonoy	Bulacan	30.00 by 39.00	25,000.00	9,750.00
Caloocan	Rizal	12.00 by 41.50	25,000.00	None.
Paombong	Bulacan	12.00 by 30.00	6,000.00	2,000.00
Meycauayan	do	21.00 by 29.80	22,000.00	2,000.00
Obando	do	12.00 by 34.50	7,500.00	537.10
San Carlos	Pangasinan	28.50 by 41.00	12,000.00	24,000.00
San Roque	Cavite	30.00 by 43.50	45,000.00	None.
Balayan	Batangas	21.00 by 43.50	15,000.00	5,000.00
Oton	Iloilo	28.50 by 52.50	25,000.00	8,000.00
Santa Maria	Bulacan	15.00 by 39.00	10,000.00	800.00
Capiz	Capiz	12.00 by 75.00	28,000.00	20,000.00

Markets under construction or being advertised.

Municipality.	Province.	Dimensions of central buildings.	Amount of Insular loan.	Amount of municipal appropriation.
		<i>Meters.</i>		
Maribojoc	Bohol	15.00 by 39.00	P10,500.00	None.
Loon	do	18.00 by 30.00	6,000.00	P4,000.00
Lipa	Batangas	21.00 by 43.00	20,000.00	5,000.00
Bulacan	Bulacan	21.00 by 43.00	25,000.00	None.
Dumanguet	Cebu	18.00 by 42.00	15,000.00	None.
Dumanjug	do	21.00 by 43.50	25,000.00	4,000.00
Aslob	do	18.00 by 42.00	18,000.00	None.
Carcar	do	21.00 by 39.80	40,000.00	None.
Barili	do	24.00 by 46.50	25,000.00	None.
Opon	do	28.50 by 39.00	18,000.00	None.
Santa Barbara	Iloilo	28.50 by 57.00	40,000.00	10,000.00
Pototan	do	24.00 by 53.90	40,000.00	10,000.00
Santa Cruz	Laguna	28.50 by 48.00	20,000.00	4,500.00
Nagcarlang	do	18.00 by 38.00	15,000.00	5,000.00
Magdalena	do	28.50 by 42.00	22,000.00	None.
Hinigaran	Occidental Negros	18.00 by 42.00	15,000.00	None.
La Carlota	do	30.00 by 43.50	40,000.00	None.
Guagua	Pampanga	24.00 by 46.50	35,000.00	6,800.00
Macabebe	do	21.00 by 39.80	18,000.00	3,000.00
Binalonan	Pangasinan	30.00 by 40.00	20,000.00	2,400.00
Dagupan	do	30.00 by 40.00	50,000.00	None.
Lingayen	do	30.00 by 40.00	22,000.00	5,000.00
Camiling	Tarlac	24.00 by 39.10	30,000.00	None.
Moncada	do	18.00 by 42.00	20,000.00	2,245.75
Ligao	Albay	21.00 by 39.80	25,000.00	6,000.00
Calasiao	Pangasinan	30.00 by 39.50	25,000.00	6,000.00
Argao	Cebu	21.00 by 39.80	20,000.00	4,000.00
Lucena	Tayabas	12.00 by 34.50	30,000.00	None.
Bato	Ambos Camarines	18.00 by 42.00	13,000.00	None.
Legaspi	Albay	24.00 by 42.80	30,000.00	7,500.00
Daraga	do	12.00 by 39.00	10,000.00	5,000.00
Loboc	Bohol	15.00 by 39.00	11,000.00	None.
Antipolo	Rizal	15.00 by 39.00	10,000.00	None.



REPAIRS TO STORAGE WORKS, OSMEÑA WATER SUPPLY SYSTEM, CEBU, CEBU, P. I.

Compiled from data furnished by E. J. HALSEMA, Associate Member American Society Civil Engineers, assistant engineer in charge.

The Osmeña waterworks system supplying the city of Cebu with water was completed early in 1912. The scope of this article precludes a detailed description of this original work. Suffice it to say that the main features of this project are an arch spillway dam located in a narrow gorge 7 kilometers west of Cebu, a large concrete distribution tank near the town, and the distribution system in Cebu itself. The project was financed by a gift from the Province of Cebu of ₱50,000 and a loan from the Insular Government of ₱500,000. Great benefits have already accrued to the city of Cebu from this undertaking. The work has been justified in every way; the general health of the community has been improved; fire risks have been

that recorded in any previous storms. No accurate records were obtained at the Cebu office of the Weather Bureau, but the attendants state that the rain gauges when observed were running over at 20 inches, the wind being too strong to reset them after being emptied. It is estimated that 22 inches fell in six hours.

As a result of this enormous precipitation the spillway, which was 19.82 meters long and 1.2 meters deep, proved inadequate, and the subsequent washout followed.

Soon after the destruction of the embankment and parapet the engineering committee of this Bureau made an investigation of conditions and reported that the spillway originally contemplated should be built, modified to suit conditions. The question of the repairs needed was approached with a view of determining the cheapest manner of making the necessary provision for flood water consistent with maintaining the usefulness of the previous work for the purposes for which it was built. A design was made which was based upon borings and



Plate I. Washout after typhoon on south side of dam.

greatly lessened; and financially the city has shown its ability to meet all payments of principal and interest on the borrowed money.

On October 14, 15, and 16, 1912, a disastrous typhoon passed over the Visayan Islands. The center of this typhoon passed very near Cebu, where an unprecedented precipitation occurred. Among the disasters at Cebu was serious damage to the storage works of the Osmeña water supply system. The dam proper resisted the force of the water, but the rock embankment and parapet wall south of the dam were washed away, leaving a gap in the hillside through which much of the reservoir water escaped. (See Plate I.) It had been originally planned to place a spillway at this point, but funds available did not permit this construction at the time, and all previous records for rainfall at Cebu indicated that such an expense was unnecessary.

Design.—The design of the spillway of the Osmeña dam proper was based on a rainfall record of ten years. The maximum reported rainfall during the period mentioned was about 6 inches in twenty-four hours at Cebu; and the maximum monthly precipitation was 17 inches. During the typhoon mentioned above, however, the rainfall exceeded

accurate surveys and which seemed to provide for the necessities of the case in the most economical manner consistent with safety. The elevation of the new spillway built on the site of the washed out embankment was set at 103 meters, the elevation of the spillway of the dam proper being 107. The length of the new spillway is 15 meters. The area of the watershed is 6.3 square kilometers, from which the maximum run-off will give a flood discharge estimated at $2\frac{1}{2}$ meters deep passing over the new spillway. The capacity of the spillway at this height is about $2\frac{1}{4}$ times as great as that of the old one and is ample to accommodate a flood even somewhat greater than that of 1912. Such a flood, enormous as it would be, would still be a meter below the elevation of the old spillway which, therefore, very likely will never come into use again, unless, in the future, Cebu needs more storage water and goes to the expense of raising the new spillway. This construction could be done at any time and the new work just completed could be utilized in the change.

Water, after leaving the new spillway, is conveyed down the declivity in a large reinforced-concrete chute or trough. This chute is

founded on the solid rock of the hillside and is so shaped that the expense of cut and fill was a minimum. It is 15 meters wide at the spillway crest, but rapidly narrows to a width of 10 meters. The total fall is 43 meters. The profile changes from an 0.8 on 1 to a 2 on 1 and finally to a 0.4 on 1 slope connected by curves of 20 and 15 meters radii, respectively. The chute is 80 meters in length along the profile, has a maximum depth of 4 meters at right angles to the profile, and a minimum depth of 1.80 meters in the last 30 meters. The cross section of the chute at any point normal to the longitudinal center line is made up of two equal arcs of a common circle separated by a common tangent 2 meters long. The radius of this circle changes from section to section throughout the flume. (See Plate II.)

Weep holes have been placed on the center line of the flume at such points as to take care of the small amount of seepage in the hillside. This amounts to about 1 gallon a minute.

Organization.—Proposals were invited for constructing this work, but none were received. On April 1, 1913, excavation was begun by administration and concreting was started on April 23.

The labor was all local and harder to obtain than on other Cebu Province projects, due to the dangerous character of the work, elimination of the 8 o'clock breakfast, semimonthly payment, distance from food and shelter, and abundant corn crops. These conditions were met by arranging with the treasurer to pay the laborers every Sunday, keeping food vendors on the job, and allowing the men to sleep in the storehouse.

Most of the labor was secured by the superintendent of the water works and through the individual efforts of the engineers. Capataces were at first paid at the rate of 5 centavos per man furnished per day, but these capataces, though placed over other gangs, were unable to get a day's work out of their men. The best success was obtained through employing capataz laborers or pace setters.

"Task" labor or "paquiao" proved cheapest whenever it could be employed and usually the best task laborers were the poorest day laborers. On occasion it was found more satisfactory to give a drone his choice of going home or doing "task" labor. This sifting process proved very satisfactory. On excavation, however, this "task" labor proved satisfactory only as long as material was uniform and it was abandoned after a week's trial. The following prices (exclusive of checkers) were paid:

Excavation, soft, decomposed limestone, 80 heaping wheelbarrows 40 meters (hauling only), 50 centavos.

Breaking rock, 12 and 15 centavos per barrel (0.1 cubic meter).

Hauling sand, 50 centavos per cubic meter (assistance furnished for unloading).

Hauling rock 300 meters on mixing board, 40 centavos per cubic meter.

Breaking rock and hauling 300 meters to mixing board, 18 centavos per cubic meter.

Carrying rock, distance 125 meters, elevation 45 meters, 80 centavos per cubic meter.

Carrying rock, distance 40 meters, elevation 10 meters, 30 centavos per cubic meter.

Loading rock on mixing board, distance 10 meters, 15 centavos per cubic meter.

Loading sand on mixing board, distance 15 meters, 15 centavos per cubic meters.

Mixing 1: 2: 4 concrete, 8 men, 2 centavos per barrel of cement per man.

Mixing 1: 3: 6 concrete, 8 men, 3 centavos per barrel of cement per man.

Mixing 1: 4: 8 concrete, 8 men, 3½ to 4 centavos per barrel of cement per man.

It is not to be assumed that the above prices held throughout the work, but the aim was to keep as near this as possible even by day labor. In this way the engineers were able to increase the efficiency of mixing from an average of 20 to 38 barrels per day for a 1: 2: 4 mixture and as high as 44 barrels per day for an "8-man gang."

The rate for day labor was ₱0.50 to ₱0.60. From 5 to 8 carpenters were employed and their pay ranged from ₱1 to ₱2.50 per day. Both the fireman and engineer were able to work as carpenters or blacksmiths so that they had continuous employment.

The men and work were organized so that no duplication in hauling material would result and each separate organization was given only enough men to do its work. When one gang depended on another an effort was made to avoid delay, so that no excuse could be found for nonperformance of work. Competition was tried with success. For instance, the sand and rock carriers attempted to keep ahead of the mixers, the mixers ahead of the engine and placers, etc. Whenever several kinds of work had to be done in a day by one gang the efficiency was immediately reduced and it was especially difficult to properly organize the labor on excavation.



Plate II. Showing old dam and new flume.

The instrument work was done entirely by a native survey boy who through his own efforts learned to adjust and use both transit and level. Errors were made occasionally, but they were usually soon noticed and corrected without much expense.

Transportation.—A wagon trail 2 kilometers long was constructed at a cost of about ₱2,000 and with an ordinary amount of maintenance a very serviceable road from the Cebu-South Road to the work was obtained. During wet weather, however, the engineers arranged to have little or no hauling done.

Mules were used to haul the first material, but this was soon found to be more expensive than hauling with carabaos, on account of the cost of shoeing and forage for the mules and the wages of their

drivers. The carabaos hauled cement at first for ₱0.50 per barrel, then for ₱0.40, and finally for ₱0.375 per barrel. However, a team of mules was always on the work to haul broken stone or get small articles needed from Cebu.

During the last month transportation was provided for carpenters to and from Cebu, saving them a 14-kilometer walk as well as several hours time, without much additional cost to the project.

Excavation.—The top layer of the excavation which had weathered was soft, but the deeper excavation was a hard yellow clay. Rock was easily blasted, though seamy in places. Some of it had to be picked or chiseled.

At first the excavation was washed down a chute, but later it was hauled away in wheelbarrows, and on account of the small working space and at times the high lift, it was difficult to maintain a very efficient organization. All excavation was carried to solid rock.

Materials.—Green Island cement was used throughout the work.

As good hard sand was not obtainable within 6 kilometers below the dam, the sand was brought from above the reservoir by means of two boats each of 2 meters capacity. It was delivered by contract to the dam and unloaded at the top with assistance of our men. From this point it was conveyed down a chute to the mixing board and washed in a box prior to use.

The broken stone used was a light blue altered volcanic rock. It was broken by hand for ₱1.20 per cubic meter. The quarry was less than 300 meters distant from the foot of the work and located near the cement shed; the rock was delivered to the foot of the flume as needed, at first by means of mule carts and later by contract at ₱0.40 to ₱0.60 per cubic meter. A wheelbarrow was stacked so as to hold one barrel (0.1 cubic meter), a much greater amount than the men could be induced to haul by day labor. Women accomplished more than men in this contract labor and were anxious to do the work.

Concrete work.—All materials were on the ground before any concreting was done and at no time were the engineers held up for any kind of material. To this is attributed a great deal of whatever success was met with in carrying on the work.

For form work lauan lumber was used throughout the work.

Weep holes were made by placing banana stalks in the concrete and removing them after the concrete had set.

Mixing boards were always placed above the work so that all concrete could be placed through chutes from the board or shoveled directly from the board into the work. Wheelbarrows and buckets were tried, but it was found that as soon as it became necessary to raise the shovel above the mixing board the efficiency of the mixers was immediately reduced and it was more economical to use a higher mixing board.

The main work was finished September 12, 1913.

Cost.—The following general cost data is presented:

General statement of costs (entire job).

Item.	Amount.	Item.	Amount.
Labor and transportation.....	₱13,127.71	Pipes and gears.....	₱2,278.19
Plant.....	49.65	Rent, maintenance of plant.....	209.59
Distributed.....	273.60	Nails and wires.....	187.89
F. supervision.....	1,162.59	Forage, shoeing, etc.....	1,139.25
Cement, at ₱6.263 f. o. b. Cebu.....	14,717.58	Sacks.....	24.00
Lumber.....	1,023.67	Screen.....	16.25
Contract transportation.....	290.50	Rope.....	198.17
Steel:		Depreciation.....	183.71
1 inch.....	139.70	Telephone and district.....	8.20
1/2 inch.....	412.31	Pipe on hand.....	681.81
3/4 inch.....	2,568.11	Value of existing road.....	15.00
Explosives.....	217.84	Engineering.....	7,532.89
Cement storage, galvanized-iron,		Total.....	47,285.23
Roofing.....	439.35		
Coal and oil.....	387.67		

Cost of concrete.

	1:2:4.	1:3:6.	1:4:8.
Cement.....	₱9,275.64	₱3,091.88	₱3,794.58
Rock.....	1,460.50	739.74	1,210.45
Sand.....	549.60	278.40	455.56
Labor, etc.....	3,057.11	1,298.34	1,019.81
Total.....	14,342.85	5,408.36	6,480.40
Cubic meters.....	651	300	490
Cost, cubic meter.....	22.03	18.03	13.23

Selected unit costs.

	Unit.	Quantity.	Unit price.
Sand.....	Cubic meter.....	609	₱2.11
Broken stone.....	do.....	1,217	2.802
Cement.....	Barrel.....	2,350	7.027
Steel.....	Ton.....	25	102.73
Mixing and placing cement:			
1:2:4.....	Cubic meter.....	651	4.70
1:3:6.....	do.....	300	4.33
1:4:8.....	do.....	490	2.08
Excavation of earth and rock.....	do.....	3,000	1.64

The work of construction described above was under the immediate charge of an assistant engineer of the Bureau of Public Works reporting to the district engineer, Cebu District.

SPECIAL ALLOTMENT PROJECTS.

The Philippine Legislature, under section 1, Act No. 2264, enacted February 11, 1913, appropriated for special allotment purposes the sum of ₱400,000 to be expended on the construction, improvement, and maintenance of roads and bridges. The allotments were made as indicated in the April 1, 1913 issue of the *QUARTERLY BULLETIN*.

The funds were expended under the supervision of the district engineers of the several provinces and the results attained, as reported by them, are herewith published.

LUNA-BACNOTAN NORTH BOUNDARY ROAD, LA UNION PROVINCE.

R. A. WHITE, District Engineer.

This project contemplates the construction of an interior road, which is the most direct line for the through road north, extending through the most productive section of La Union Province, including the municipality of Balaoan with 7,500 hectares of first and second class rice lands. This is a diversion from the old Spanish location, which follows the coast line, and for the greater part through a non-productive country. The total length of the new location is 30 kilometers, 16.8 kilometers of which are actually under construction. The road embankment was constructed under the "small-task (paquiao) system" whereby the local inhabitants, under an informal agreement, undertook to construct short sections at a stipulated price. Under this method the average cost of embankment approximated ₱0.25 per cubic meter. This does not include the cost of rolling. Eighteen 61-centimeter concrete-pipe culverts, one 4-meter, and one 5-meter concrete box culverts have been completed to date. The first course of surfacing has been placed and rolled over 7 kilometers of the completed subgrade and 3½ kilometers have been entirely completed. The class of construction and results obtained can be judged from the cut below. A hard and durable screened gravel is being used as surfacing material and deposited on the road at an average cost of ₱2.90 per cubic meter with an average haul of 3 kilometers. This work is also being done by local native contractors.

The thirty thousand people of the municipalities of Luna, Balaoan, and Bangar will be directly benefited by this project. The greatest benefit, however, will accrue to the inhabitants of the municipality of Balaoan, who in the past have been completely isolated during each rainy season.

The territory traversed by the 16.8 kilometers of road now under construction produces one crop of rice and one crop of tobacco annually. The average rice production is 5,200,000 pounds and the average tobacco production is 5,000,000 pounds per annum.

The second-class coastal road is at present passable to all classes of traffic during the dry season, and during this period shows an average traffic of 150 vehicles per day, including two automobile lines operating on schedule, making triweekly trips between San Fernando and Vigan. Immediately upon the completion of the first-class road these lines will operate during all seasons of the year with every indication that the amount of traffic will, within a few months after the completion of the road, increase to three or four times the present amount.

THE BALAYAN-TUY ROAD, BATANGAS PROVINCE.

J. H. CATON, District Engineer.

In the western part of the province are situated the towns of Balayan, Tuy, and Nasugbu. The chief article of export for this section is sugar, of which very large quantities are shipped to Manila, there to be refined and marketed. Balayan is the shipping center for the corn and rice that has to be supplied to the purely sugar-raising area of this section. Those who do not know are surprised to learn the amounts of these products raised in the district. The following tabulation, taken from the report of the municipal secretaries concerned, will serve as a good indication of the amounts of sugar and rice produced during their respective seasons:

Municipality.	Sugar mills.		Rice mills.		Refinery.	
	Number.	Daily capacity.	Number.	Daily capacity.	Number.	Daily capacity.
		<i>Kilos.</i>		<i>Liters.</i>		<i>Kilos.</i>
Balayan	162	93,799	1	3,750		
Tuy	104	57,494				
Nasugbu	162	53,340	5	55,500	1	9,487

This amount of traffic is probably a fair average for the sugar-harvesting season each year, which lasts from February to May, inclusive. During the rainy season the old road became practically impassable and traffic necessarily dropped to insignificant figures.

Before construction, the road at its best was in a wretched condition. It never had been surfaced and the result of years of wear incident to the heavy traffic had caused the formation of a trench wide enough for two carretons to pass. Each year this trench became deeper as the wagons ground the road down. The new road is standard section—4-meter macadam surfacing, with 1-meter shoulders, side slopes of 3 to 1. The surfacing consists of a 17½-centimeter course of broken stone and a 5-centimeter finishing course and binder. The subgrade is rolled thoroughly, usually in 30-centimeter courses, then the section to be surfaced is shaped to conform to the finished road and rolled between two 2 by 6 inch wooden stringers set up on either edge of the surfacing. Outside these stringers the shoulders are built up. The surfacing is then rolled in two courses, the 2 by 6 inch stringers being removed for the rolling of the second course and the shoulders rerolled at the same time. A 750-gallon water wagon hauled by 4 mules is used for watering the subgrade



Balayan-Tuy Road, finished section (Batangas Province).

All of the export sugar of Tuy must go over the road between that municipality and the port of Balayan, 9.5 kilometers away. It is estimated that in addition, 35 per cent of the sugar exported from the municipality of Balayan and 5 to 10 per cent of that of Nasugbu go over this same route. Also practically all the rice used in Tuy comes in over this road. The total population of these three towns, according to the 1903 census, is 17,603. This total is undoubtedly too small for the section at the present time, as the country is now under a highly advanced state of cultivation and laborers, even Japanese, are being continually brought in to increase the cultivated area.

The last traffic census, March 4 to 11, 1913, was taken during the sugar harvesting season with results as follows:

[Average per day of twenty-four hours.]

Carts:	
Loaded	200
Empty	91
Carromatas:	
Loaded	68
Empty	55
Total vehicles	414

when necessary and for flushing the surface on the final rolling of the finished road.

The average cost per kilometer was ₱7,106.85. The unit costs for grading and rolling subgrade were ₱1,107 per cubic meter. Stone was broken by hand (at ₱1.20 per cubic meter), delivered and rolled at a total unit cost of ₱6,727 per cubic meter, including breaking. In view of the wealth of the landowners concerned, it is confidently expected that they will avail themselves of their opportunity and will use motor trucks for hauling out their sugar, using their animals for extending their cultivated area. On one road recently finished in this province, five-passenger automobiles were running on it within six weeks after completion, where none had ever attempted operating before. However, it is expected that the Balayan-Tuy Road will immediately develop into a heavy freight-traffic road, rather than into a heavy passenger route.

TAYTAY-ANTIPOLO ROAD, RIZAL PROVINCE.

J. G. BECKJORD, District Engineer.

In November, 1912, an allotment of ₱75,000 was made to construct a first-class road from Taytay to the railroad station at Antipolo, a

distance of 7 kilometers. The alignment of the road was corrected throughout and the maximum grade of 7½ per cent established. Work started in December, 1912, breaking stone alongside the road from boulders at a cost rate of ₱2 per cubic meter. Three to four hundred men were set to work on the grade, which was completed about the 1st of April, 1913. Work on the surfacing was carried on at the same time and the road completed first-class from Taytay to Antipolo at the end of April, 1913.

The money was expended under the following heads:

Materials	₱9,531.51
Rock	9,213.50
Transportation	11,871.10
Labor	30,046.33
Miscellaneous	2,787.41
Surcharges	9,806.09
	73,255.94
Outstanding obligations	737.00
Total	73,992.94

The average traffic to justify the construction was estimated at 75 vehicles per day. The traffic census taken during May shows more

Estimated number of passengers:

Autos	76,284
Carreteras	100,796

The heavy traffic in no way affected the road except to keep the shoulders constantly torn up. The heavy rains of the past month have likewise had no serious effect as compared with the damages done by similar rains to the old Spanish road.

NAIC-INDANG ROAD, CAVITE PROVINCE.

CHAS. R. BENNETT, District Engineer.

The Manila Railroad Company has completed its line into Naic (a distance of 55 kilometers from Manila by rail), but the products of the large section of rich country lying south of a road from Naic to the Batangas boundary, via Indang and Mendez-Núñez, can only be transported in the dry season and then over very bad roads. By building the Naic-Indang Road first and then connecting up the neighboring municipalities this section of the province will be best and most economically served.

The funds available to date for the construction of this road aggre-



Balayan-Tuy Road, under construction (Batangas Province).

than enough vehicles passed over the road in one month to justify the cost of construction.

Following is a daily traffic census for the month of May. Heavy traffic continued through June, and, although diminishing slightly through the later part of that month, assumed its normal condition again in the month of July.

Date.	Auto- mobiles.	Carre- telas.	Pedes- trians.	Date.	Auto- mobiles.	Carre- telas.	Pedes- trians.
May 1.....	178	392	348	May 20.....	306	592	507
2.....	131	369	547	21.....	354	505	636
3.....	192	422	1,892	22.....	329	574	485
4.....	56	200	1,937	23.....	324	867	1,006
5.....	110	1,004	2,102	24.....	826	1,146	862
6.....	90	736	1,754	25.....	560	1,132	1,408
7.....	294	1,829	3,555	26.....	194	321	485
8.....	44	172	1,326	27.....	270	313	626
9.....	690	1,957	2,420	28.....	263	380	554
10.....	844	1,486	1,731	29.....	183	349	457
11.....	1,480	2,179	2,224	30.....	428	446	483
12.....	710	1,199	1,103	31.....	372	741	510
13.....	272	599	891				
14.....	234	1,050	1,150	Total.....	12,714	25,202	27,885
15.....	814	1,310	2,901	Average daily traf- fic.....	410	813	1,222
16.....	392	1,279	1,377	Greatest daily traf- fic.....	1,480	2,179	2,224
17.....	384	450	810				
18.....	1,114	813	1,157				
19.....	276	390	641				

gate ₱124,968.50, including special allotments. Actual construction was commenced in December, 1912, and continued until June, 1913, when the rainy season set in. Eight and one-half kilometers of grade were completed and 7½ kilometers of surfacing finished. Sufficient materials, broken stone, cement, supplies, etc., are on hand to complete kilometer 10. From the Naic station to a few meters past the Naic-Maragondon Road junction (1.76 kilometers) the surfacing was placed 15 centimeters deep. From there on, 20 centimeters of good adobe and 12 centimeters of broken-stone surfacing were used with a 4-meter width and 1.5-meter shoulders. The total amount of embankment in place to date is approximately 16,000 cubic meters, the unit cost of which was ₱0.80. Most of this was mucked up from the rice paddies. Drag scrapers with bulls were used on the higher elevations where the earth had become thoroughly dry. Four thousand cubic meters of broken-stone surfacing, at a unit cost of ₱7.40, has been laid and compacted. Work was held up considerably on the whole job on account of having only one 12-ton roller. This arrived February 1, 1913, and was used sixteen hours a day through February, March, April, and May.

The total population served immediately by the construction of this road will be that of Naic and Indang with 23,200 people, but as

this road is to act as a base or trunk road for practically all the southern part of the province, there will be some 60,000 additional people who will benefit through its construction.

A traffic census taken on this road near Indang prior to its construction in 1912, showed no carts or other vehicles. A traffic census taken at the same time near Naic and one taken after construction are given for comparison.

	Before construction (1912).	After construction (1913).
Carts.....	106	139
Carromatas.....		29
Automobiles.....		16
Pack animals.....	188	122
Pedestrians.....	560	233

This increase in vehicles is shown notwithstanding the fact that less than 8 kilometers have been completed to date. Figuring 1 ton load to each cart, there will develop with the completed road approxi-

the sections from Maasim to San Miguel and from Camias to Baluarte, the Nueva Ecija boundary. Construction work was begun in May, 1912, and has proceeded with ordinary regularity ever since. Eleven kilometers of subgrade were completed during the early part of 1913. This subgrade was practically all constructed by local contractors who did the work at a uniform price of ₱0.48 per cubic meter and sublet it to native laborers, who were paid in rice or cash as they desired. This system worked very well, as the entire responsibility for securing rapid and efficient work lay with the local contractors, who seem to be able to drive their laborers with much more vigor than can ordinarily be expected from a foreman in the employ of the Government. The one difficulty with this system seems to be that the contractor does not usually leave the subgrade in a satisfactory condition. His cut slopes are apt to be too steep and the slopes of the fills are irregular. Because of this defect and in order to secure a workmanlike appearance, it was necessary to have a gang of men go over the subgrade for the purpose of correcting slopes. The average cost for subgrade in place was 64 centavos per cubic meter. The difference between the price paid to the local contractor and the



Taytay-Antipolo Road, new location (Rizal Province).

mately 200 tons of freight per day. This will be rice, hemp, and sugar, in rank of importance as named. No doubt automobile trucks will be used to haul products, as several parties have already shown an interest in the matter.

After passing kilometer post 2 the new location goes through open rice land for about 6 kilometers. Two-year-old trees have been planted on 2½ kilometers of this section. Sampaloc, cassia siamea, and rain trees were used, alternating three cassia siamea with two sampalocs, 20 meters apart, and then two rain trees 25 meters from the others and 25 meters apart. This permits 90 trees to each kilometer. (See plate below.) They are all protected by triangular-shaped frames which were made of old concrete form lumber. The total cost of trees planted, frame set, and maintained two weeks is approximately ₱2.50 per tree, or ₱225 per kilometer. This cost was charged to construction.

MANILA-NORTH ROAD, BULACAN PROVINCE.

J. L. HARRISON, District Engineer.

To complete the through road as first class for Bulacan Province, a total special allotment of ₱70,000 was made for the construction of

average cost to the province is made up of the items superintendence, revising of slopes on the fills, grassing of all slopes, and surcharges.

The most serious problem encountered in connection with this project has been the securing of surfacing material. After considerable effort arrangements were made to have gravel delivered by the railway company from a gravel pit at Peñaranda. Approximately 6,000 cubic meters in all have been delivered. The cost of screening and loading at the pit was ₱1 a cubic meter and the freight to San Ildefonso something less than ₱1.50 a cubic meter. This gravel, therefore, cost the Province of Bulacan approximately ₱2.50 per cubic meter at San Ildefonso station and about ₱2 at San Miguel station.

From the station at San Ildefonso the average haul to that part of the road which has been surfaced is about 5 kilometers and the average cost of hauling about ₱2.25 per cubic meter. Six kilometers have been surfaced at an average cost of ₱5.80 per cubic meter of gravel delivered.

The traffic census taken in this province shows that the traffic from Baliuag to San Ildefonso has increased very materially since the completion of the 6 kilometers of road between Maasim and San Ildefonso. It also indicates a very small amount of traffic between



Naic-Indang Road, new construction, with trees properly planted (Cavite Province).

San Ildefonso and San Miguel. This condition will probably largely disappear as soon as the road is completed into San Miguel, which is the natural outlet for the business originating around Maasim and San Ildefonso.

One truck has already been purchased in San Miguel, the expectation being to operate it in the transportation of rice as soon as the

road to Baluarte has been completed. If it proves a profitable investment, doubtless other trucks will follow it.

The experience in this province has been that the opening up of passable roads has always resulted in a very rapid increase in the amount of carromata traffic. This was true between Malolos and Hagonoy when the ferries were replaced by modern bridges.



Kilometer 62, Maasim-San Miguel Road (Bulacan Province).

THE CALAMBA-CANLUBANG ROAD, LAGUNA PROVINCE.

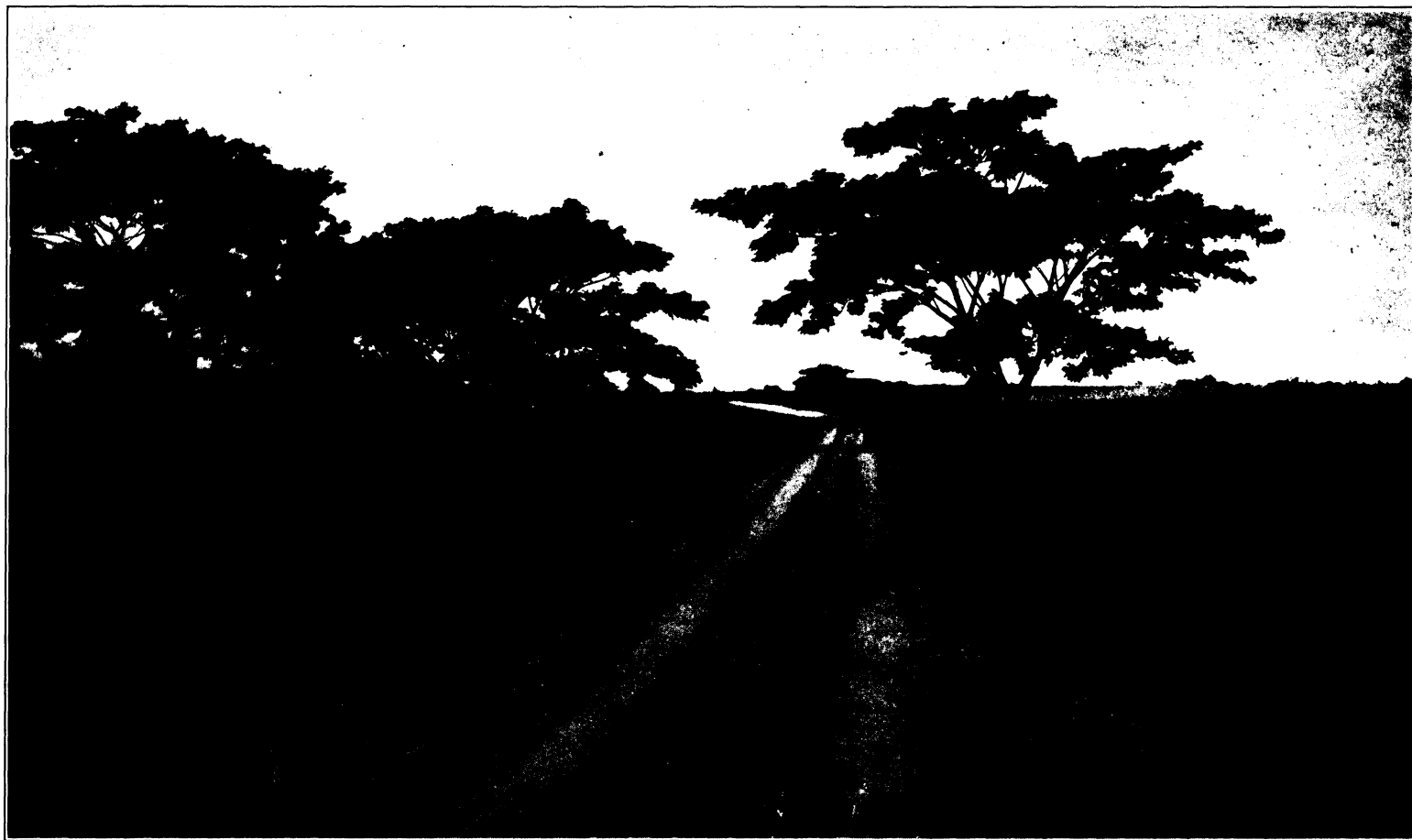
J. R. BARRY, District Engineer.

This road connects the barrio of Canlubang on the Calamba friar lands with the town of Calamba and lies wholly within the municipality of Calamba. Canlubang is the site selected by the Calamba Sugar Estate for their mill and central buildings, and has at present a population of some 5,000 people. The funds for this project were made up of a ₱15,000 private contribution and ₱38,000 allotment.

Prior to the construction and opening of this road, Canlubang had no outlet except over a dirt trail through the barrio of Putol, Cabuyao, on kilometer 51 of the Manila—South Road, which could be used only during the dry season.

The road as constructed has for its maximum grade 4 per cent, and its tangents are connected by parabolic curves widened and super-elevated according to the degree of curvature. The broken-stone metaling is 4 meters wide on tangents and was laid 20 centimeters

when sufficient subgrade had been prepared for the metalling to begin, the work was constantly delayed by the inability of the railroad company to make regular deliveries due to congestion of the sugar estate freight on the Canlubang line. Approximately 15,000 cubic meters of earth and adobe was handled at an average cost of ₱1 per cubic meter. A considerable part of the earth that was used on kilometer 55 was borrowed and hauled from 100 to 200 meters. Explosives were used in one or two places, but usually the adobe was either soft enough to loosen easily with picks or else the cut was too shallow for the use of explosives. The stone used cost ₱3 per cubic meter on board cars at Los Baños and the freight ₱0.464 per cubic meter. Unloading from cars, loading on carts, and hauling an average distance of 1½ kilometers cost approximately ₱1.25 per cubic meter. The extra high cost of unloading and loading was due to the fact that the railroad company delivered our cars at night and as there were no switches at any of the unloading places, the cars had to be unloaded during the night in order that the line might be opened the next day



Calamba-Canlubang Road (La Laguna Province).

deep loose and rolled to a compacted depth of 15 or 16 centimeters. The shoulders are 1 meter wide with outer slopes of 1 to 4 except on kilometer 55 where the slope is 1 to 3 on account of the roadbed being raised 40 to 60 centimeters through rice land subject to overflow.

Two temporary wooden bridges, five small standard box culverts, and seven pipe drains were built. The two temporary bridges, one of two spans and total length of 9.6 meters and the other of three spans and total length of 14.17 meters, were built to one side of center line so that the permanent bridges can be built later without interfering with traffic.

A summary of traffic census recently taken shows that for a day of twenty-four hours the average number of vehicles is 190. The traffic is constantly increasing, and later, when this road is connected with the system of plantation roads that the Calamba Sugar Estate plans to build, it is probable that traffic will be largely increased.

Construction was begun on March 17, but very little was done for several weeks on account of impossibility of securing laborers. Later,

for construction work. The service was very poor and there were many times when we were notified to be ready to unload cars and none came, although we had our laborers on hand at considerable expense.

VILLASIS-BINALONAN ROAD, PANGASINAN PROVINCE.

C. G. MORRISON, District Engineer.

This road follows the old Spanish location from the Agno River where it connects with the present Bautista-Rosales Road, through the large and prosperous municipality of Urdaneta and connects with the first-class Lingayen-Tayug Road at Binalonan. Although being part of the proposed Manila-North System, this road was primarily constructed to open to market that rich agricultural section comprising the three municipalities traversed.

The old dirt road was passable in part for carts during the dry season, November to June, but during the remainder of the year practically nothing but pack animals and pedestrians could make the com-

plete trip. During the month of June the cart traffic on the completed section of the work, as a result of the large rice crop, was unusually heavy for a new road.

The subgrade was constructed with a 7-meter width between shoulders and required a total of 82,855.55 cubic meters, placed at an average unit price of ₱0.547 per cubic meter. This includes rolling. Most of the embankment was placed under the small-task (paquiao) system. The surfacing material is a hard and durable gravel which was screened and rolled in three courses at a cost of ₱4.53 per cubic meter, complete in place. The metalled section was constructed 5 meters wide and approximately 20 centimeters deep. The total cost of the road, exclusive of structures, was ₱138,258.19, averaging ₱6,913 per kilometer. The rolling of both subgrade and surfacing was done with 10½ ton road rollers. The total cost of structures on the road was ₱127,963.33. Since its completion, the

province, no doubt a decided increase in all lines will be shown. The estimated present value of the production of the municipalities of Binalonan, Rosales, Urdaneta, and Villasis is placed at a little more than ₱3,000,000, made up largely of tobacco, rice, sugar, and corn.

A large amount of building materials are being already hauled over the road, indicating a building boom for Urdaneta. The municipality also has arranged to construct a reinforced-concrete presidencia building as a result of the improved order of things.

VIGAN-SOUTH BOUNDARY ROAD, ILOCOS SUR PROVINCE.

E. D. SMITH, District Engineer.

There is at present a continuous first-class road for a distance of 57 kilometers south from Vigan. This leaves 28.5 kilometers from Candon to Tagudin to be constructed as first-class in order to place Vigan within a twelve-hour journey from Manila. While this un-



Kilometer 32, Villasis-North Road (Pangasinan Province).

road has gone through two severe baguios, overflowing sections of the road in many places without damage to the subgrade and only slightly damaging the surfacing.

The traffic on this road, based on census and ferry records of the municipalities, shows an average of 117 vehicles per day. As the entire road has just been completed and this being the rice planting season, a new traffic census has not been taken. It is entirely apparent, however, that within five or six months traffic will readily approximate 400 vehicles per day. One transportation company has already made arrangements to install a regular automobile service between Bautista and Camp One, a distance of 69.3 kilometers. This was made possible through the construction of the Villasis-Binalonan Road. The indications are that during the next five years general agricultural conditions will easily improve from 30 to 40 per cent. As Urdaneta is the largest municipality in the eastern half of the

completed section is readily passable for automobiles in the dry season, it is only passable for carromatas in the rainy season and with considerable difficulty at that. Special allotments are being made with a view to completing this section as first-class within the earliest date possible. The subgrade has been constructed for 8 kilometers, 3½ kilometers of which have been surfaced and entirely completed. All work on this project was suspended during the rainy season, but has been resumed and is being prosecuted to the fullest possible extent at present. A rock crusher has been installed at Candon and a broken-stone macadam surface is being placed 4 meters wide and 20 centimeters deep. The width of subgrade is 7 meters between shoulders with 3 in 1 slopes. Both subgrade and shoulders are being thoroughly rolled with a 10-ton road roller and the most approved construction is employed throughout. The cost of the road work complete approximates ₱5,000 per kilometer.

The importance of this project cannot be overestimated. At the present time the United States mail for the Provinces of Ilocos Norte and Ilocos Sur is being handled by the coastwise boats with a weekly service. As the Ilocos coast is exposed to the open China Sea, without safe harbors, the landing of passengers and mail is often delayed for weeks at a time. With the completion of the Candon-Tagudin section, while it will not make the road first-class from the end of the railroad at Bauang, La Union, to Laoag in Ilocos Norte, it will, however, remove the greatest obstacle to through traffic and will only leave short isolated sections to be constructed as first-class. These sections are at present good second-class roads and open to all kinds of traffic at practically all seasons of the year. With the Candon-Tagudin section completed, through traffic may occasionally be delayed for two or at the most three days on account of high water or baguios, but even at that the trip will be sufficiently feasible to divert a large part of the passenger traffic and the mail from the uncertain water transportation to passenger trucks and automobile overland means of transportation from the end of the railroad to Laoag. This will place the entire Ilocos country as far as Laoag within twenty-four hours

right of way, and traffic, as a rule, found its way through rice paddies and the adjacent fields.

The new road construction included a high embankment, averaging approximately 3,000 cubic meters per kilometer. This was made at a unit cost of ₱0.919 per cubic meter. The subgrade was constructed with a 6-meter width between shoulders with 3 in 1 slopes. The metal section was constructed with a 4-meter width, using screened gravel, placed to a depth of 20 centimeters, and thoroughly rolled in courses at a unit cost, complete in place, of ₱3.72 per cubic meter. The average cost per kilometer for grading and surfacing was ₱5,753.92.

While this section has been completed and opened to traffic, only a small amount of traffic has developed, which is accounted for in that this section of road for the present is only serviceable to the local inhabitants living alongside of its location. It is entirely inaccessible for through traffic at this season of the year, being disconnected with the Bulacan first-class road system through an unfinished section between the boundary and San Miguel. The latter section has been graded and the subgrade is standing through the present rainy season. With the prospects for an additional allotment, before



Vigan-South Boundary Road, under construction (Ilocos Sur).

of Manila. Automobile transportation lines are already making schedule triweekly trips over this route during the dry season. In addition to the through traffic there is a large amount of intermunicipal traffic which will be benefited by the construction of this road. A traffic census taken on this section between January 6 and 21, 1913, shows an average daily traffic of 95 vehicles aside from automobiles. The entire country traversed by this road is extensively cultivated and thickly populated.

GAPAN-BULACAN BOUNDARY ROAD, NUEVA ECIJA PROVINCE.

A. W. AUSTIN, DISTRICT ENGINEER.

This is a part of the Manila-North Road system extending through the rich rice lands of Nueva Ecija, from the Bulacan boundary to the town of Gapan. Although it has been possible at intervals for the last two years to make the trip from Manila to Pangasinan Province and Baguio in automobiles, this section of the road has been extremely difficult to get over even in the dry season. There was no defined

the close of the present calendar year the surfacing will be placed and the through road completed as far as Gapan. Both road sections are of an interprovincial nature and consequently all funds are being provided by the Insular Government for their construction. While the territory traversed by this road is not thickly populated, it is, nevertheless, extensively cultivated in all directions, rice is being planted and harvested on a large scale, and modern machinery is being employed. With the construction of this road the rice production will no doubt increase, the enormous expense of transporting rice to the market will be very materially reduced and, as a result of subsequent prosperity, the general condition of the farms of this section will very materially improve. This road will give Manila easy access by motor to one of the most interesting agricultural sections of the Islands.

To further improve traffic conditions, a collapsible deck bridge is being constructed across the Peñaranda River at the Gapan end of this road. This stream has its source in the mountains and is subject to very sudden rises, a contingency which through travel had to contend with at all seasons of the year and which will now be removed.

EXCHANGES.

The April issue, in particular, was very "meaty." In many ways it is the best of the publications we receive devoted to the interests of a governmental bureau or department. A number of large engineering organizations in this country have bulletins, but they do not print the quality of material shown in your April issue.—EDITOR, *Engineering Record*.

I have just received and read with great interest your QUARTERLY BULLETIN of the provincial division, Bureau of Public Works, Philippine Islands, April 1, 1912.

I think this is most excellent and I should like to have a number of each issue for use in the Bureau.—CHIEF, BUREAU OF INSULAR AFFAIRS.

Desiring to obtain for publicity purposes the bulletins published by your office, I would thank you very much to please send me numbers published up to date and those to be published in the future and in case it is necessary to pay any price therefor I shall be pleased to remit the same.—SIMEON GARCIA ROXAS.

I consider that your publication is more useful and instructive in some respects to an engineer who works here in the Philippines than any similar literature published in the States, for the reason that in

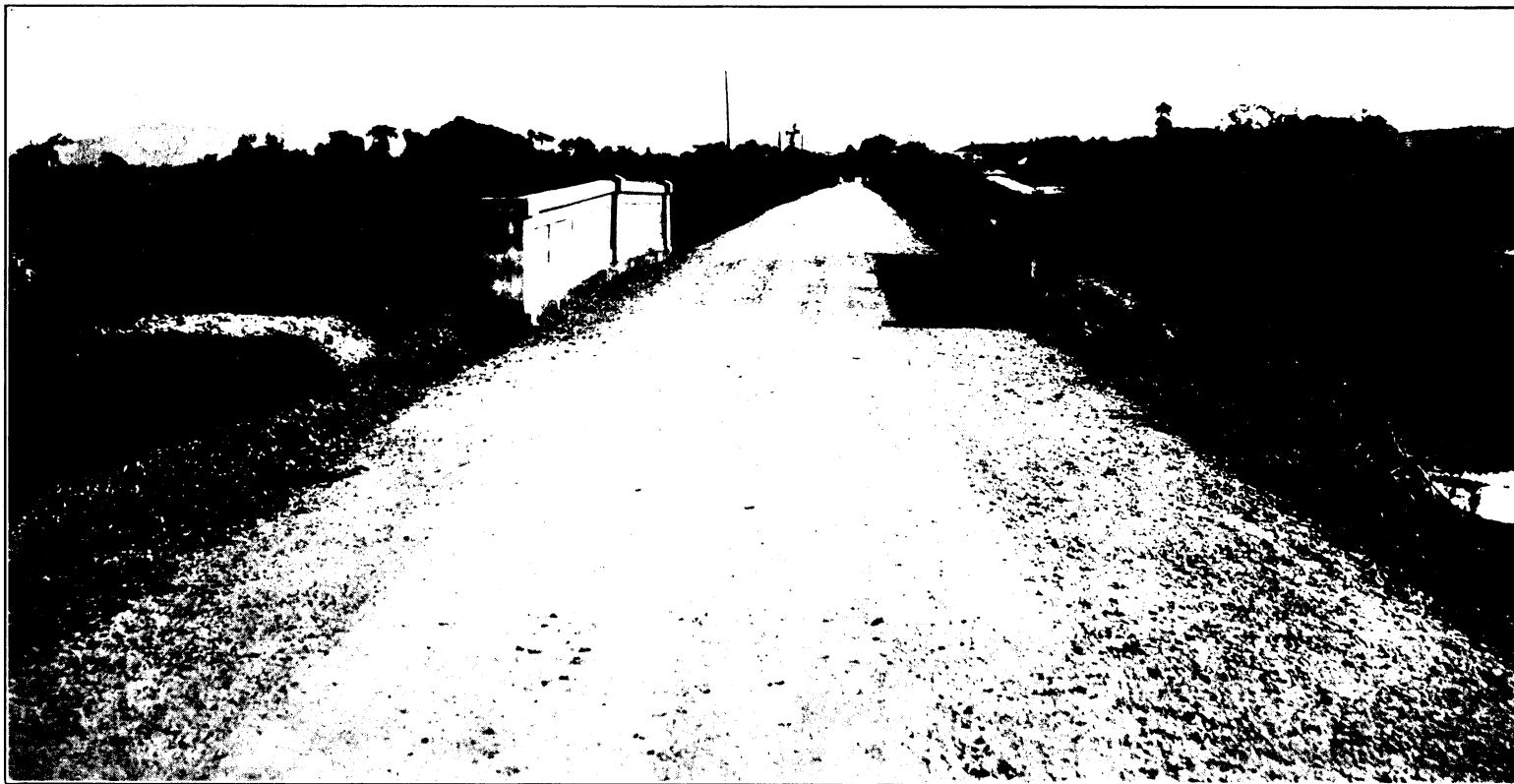
Mr. Charles H. Farnum, at one time supervisor of this Bureau and later in the employ of the J. G. White Company, as chief engineer of the Cebu division of the Philippine Railroad Company, is now at Pernambuco, Brazil, engaged on electric-railroad construction for the same company.

Mr. F. D. Nash, well known in the Bureau as division engineer, has been heard from at Durango, Uruguay, where he is locating engineer for the Pan-American Railway.

Mr. H. A. Raider, district engineer of Cebu, and Mr. P. M. Ostrand, assistant engineer, Leyte, resigned during August, 1913, to accept attractive positions with the Chinese Government on railroad construction work, with headquarters at Ichang, Hupeh Province.

Mr. O. N. Powell, district engineer of Ambos Camarines, is on his way to the States on accrued leave, traveling by way of the Malay States, India, and Europe. He plans to spend several weeks in India and Ceylon making a special study of the methods of road maintenance in those countries.

Mr. Robert G. Dieck, who was some years ago supervisor of Rizal Province, and later held the positions of superintendent of water supply and sewers and city engineer of Manila, and lately has been consulting engineer of Portland, Oregon, has recently been elected commissioner of that city under the new Portland commission charter.



[See page 24.]

Vigan-South Boundary Road, completed section (Ilocos Sur).

it you deal with engineering problems under circumstances and conditions met in this country, while the States engineering magazines deal with problems under circumstances entirely different from those out here.—JOSÉ P. KATIGBAK, *Acting First Assistant City Engineer*.

ON THE JOB HERE AND THERE.

Mr. J. W. Graham, formerly district engineer in Misamis and Bangas, has taken advantage of his accrued leave to spend a well-earned vacation in the States.

Mr. J. A. Mannington, at one time assistant engineer in the Bureau, is now structural engineer in the building department, city of Los Angeles, California, at a salary of \$2,100 per annum.

Mr. J. C. Carpenter, district engineer of Albay, expects to leave on the October transport for a vacation in the United States.

Mr. E. C. Blosser, formerly district engineer of Leyte, is located in the county surveyor's office, Zanesville, Muskingum County, Ohio.

Mr. M. C. N. Connor of the division of engineering design, with Mrs. Connor, sailed September 25, via Europe, to spend his vacation in the United States.

Mr. W. L. Gorton, chief irrigation engineer, has just returned from a short vacation in China and Japan. Mr. Gorton visited Hongkong, Shanghai, Chinwangtao, Peking, including the Great Wall at Mon Kow Pass, Port Arthur, and Nagasaki. Mr. Gorton speaks highly of the railroads now being constructed by the Chinese Government, 90-pound rails and rock ballast being used throughout.

Mr. Wm. M. Haube, superintendent of special projects, sailed in August, 1913, to take advantage of his accrued leave in Europe and the United States. Mr. Haube will also investigate the latest developments in France, England, and the United States in motor omnibuses and trucks for heavy traffic and grades, with special reference to their suitability to meet exacting conditions in the Philippine Islands.

Mr. W. J. Grodske, assistant engineer, division of engineering design, has just returned from a 1,000-mile motorcycle trip through Java. He reports the roads to be well built, with good grades, and substantial bridge structures of both concrete and steel, but details of surfacing and road maintenance are not as carefully looked after and have not been brought to as perfect a state of development as here in the Philippine Islands. A side trip from Sourabaya to Tosari, a sanitarium and health resort, took him over a remarkable piece of road building, where, in a distance of about 15 miles, an altitude of

nearly 6,000 feet was reached, with an almost even and steady climb, the grades at no time exceeding 10 per cent. This road was marred, however, by the extremely large and coarse gravel surfacing used, making transportation both rough and uncomfortable.

PROJECT NOTES BY DISTRICT AND DIVISION ENGINEERS.

ALBAY.

Stone has been quarried for surfacing the streets surrounding the provincial building and plaza in Albay. The improvement of these grounds and the streets has made a favorable impression upon the local authorities. The plaza was graded and Bermuda grass planted, the old Spanish fence was partially restored and put in good shape, the band stand moved and painted green to render it as inconspicuous as possible, and all masonry was given a coat of cement wash. Some years ago an old base for a fountain was built in the west half of the plaza, but for some reason no provision was made for water. This base was an obstruction in the path through the plaza, and since there is very little possibility of water being available for a fountain, it was removed and a walk graded over the spot. The fence around the plaza was originally made up of large posts like inverted cannon, placed about 4 meters apart, and the space between closed with a railing supported by molded or built up posts, with a lime center and bricklike exterior. In restoring this fence only the large posts were restored, it being the intention to connect them with a chain at some later date. The municipal presidente furnished coconut trees to plant around the borders of the plaza and also set all the prisoners at work to clean up the adjacent streets and plant Bermuda in the open spots. The local Catholic Church authorities cleaned up their front yard, trimmed the trees, and adjacent property owners also took heed and cleaned up their premises.

The municipality appropriated ₱4,100 for the repair of its streets at the beginning of the year. This fund has been conserved as much as possible and the municipal prisoners used to do light grading to supplement the work done under the district engineer's supervision. The presidente has become an enthusiastic aid in the work.

The Quinale bridge, two 130-foot steel spans at Malinao, is nearing completion. The steel has all been erected and will be riveted before the middle of October. The contractor for the floor delivered about 2,000 board feet of ipil for the floor and then started sending guijo. He was notified that his contract had been canceled and the lumber ordered from the Insular Purchasing Agent. The contract for the fill between the two spans totaling 800 cubic meters, was let at 45 centavos a meter. The fill at the ends of the bridge is being accomplished by administration. Conditions at present indicate that the bridge will be finished for about ₱55,000, which is ₱5,000 less than the estimate, and the filling was not included in the estimate.

Tabaco central school, San Jose barrio school, San Antonio barrio school, and the trade school at Albay have had their roofs painted with Eureka Black Diamond paint. In addition to other benefits this has materially helped the appearance of the building. The school at Libon will be painted with De Co paint.

The contract for the building of a sea wall on the Legaspi market site has been let for ₱1.85 per meter of stone in place. This wall will inclose all the portion of the market site which is subject to overflow. It will be a half meter wide on top, have $\frac{1}{2}$ to 1 slopes, and average 2 meters in height. The same contractor took the contract for filling the portion of the site where the first building is to be constructed. This fill totals 1,800 cubic meters and the contract was made for 40 centavos per cubic meter. All buildings on the site are being removed.

B. F. Mills has the contract for the Tigao market construction and has started operations. The contract calls for one type "A" market and the contract price is ₱12,500.

The Guinobatan market site is being cleared of all buildings and old masonry walls. This work is being carried on by the municipality with prison labor.

The foreman on the Catanduanes trail construction reported scarcity of laborers. The aid of the lieutenant governor was asked and the force has been increased from 20 men to 70 men. The work is being carried on at a point 15 kilometers from any barrio and laborers refuse to work so far away from home. By making arrangements to furnish them rice and fish it is expected that they can be held on the job.

The construction of the culverts on the Malilipot-Bacacay Road has been started. The estimate for the culverts is ₱2,450, but there are some cases where more repairs will be necessary than were originally contemplated and it is probable that the ₱8,000 which has been provided, will be all used on this project.

The Albay intermediate school, plan 20, without the four rear rooms, has been completed in a very satisfactory manner by B. F. Mills, contractor, and the building has been turned over to the Bureau

of Education. A concrete gutter was built around the base of the building to protect the foundations and carry off the rain water. This gutter was built by Mr. Mills for ₱90 in addition to the contract price.

AMBOS CAMARINES.

The reconstruction of the Nueva Caceres boundary road has been completed to kilometer 20.

The construction of the Magarao central road is about 90 per cent completed.

A contract was let to Allen & James for the construction of the Naga Bridge (No. 0.3) on the Nueva Caceres boundary road. This bridge consists of five 7.5-meter reinforced-concrete deck girder spans on reinforced-concrete piles. The contract price is ₱16,000.

Bids for the construction of bridge 43.3 on the Iriga-Buhi Road have been advertised for. This bridge will be a 20-meter reinforced-concrete arch.

A reconnaissance was made for a road to connect the Partido of Lagonoy with the main road system. There were three routes under consideration, viz, from Nueva Caceres via Calabanga and Tinamloc, around the north side of Mount Isarog, to Goa; from Pili to Tigaon, following the south slope of Mount Isarog; and from Iriga to Sagnay, following the northwest slope of Mount Iriga and the south east slope of Mount Isarog. When the final location is made, the province will construct and maintain a trail until sufficient funds are available to build a first class road.

A cart road is under construction from Guijalo to Caramoan, about 4 kilometers in length. Two and one-half kilometers of this is rather difficult work, as it is necessary to cross a pass 80 meters above sea level, and part of it crosses the face of a limestone cliff. The road is located with a 7 per cent grade on the Guijalo side and 5 per cent grade on the Caramoan side. The town of Caramoan is in a valley



Gravel quarry on Pauili River about 1 kilometer west side of kilometer 18.9, Nueva Caceres-Boundary Road, Ambos Camarines.

entirely surrounded by hills, drainage being effected by an under ground stream. Work started on this project on June 26 and at present the 3-meter cart trail is completed to the top of the divide, a distance of 1 kilometer. At this stage the original appropriation of ₱2,200 became exhausted. The municipality appreciating the advantage of this trail made an appropriation of ₱3,000 and the province an additional appropriation of ₱3,000, making a total for this work of ₱8,200, so that the entire road can probably be completed and will be opened for cart traffic about December 1.

The maintenance prizes for Province of Ambos Camarines were awarded on September 20. The capataz on section No. 1, of the Nueva Caceres boundary road was awarded the ₱50 prize for having the best maintained section. The caminero on kilometer 8, section No. 1, was awarded the prize of ₱20 for the best maintained depositories; and the caminero on kilometer 37, section No. 3, the prize of ₱30 for the best maintained kilometer. The caminero capataces were allowed to attend the "Peña Francia" on Saturday, September 20, in uniform; after the parade, in which they participated, the prizes were presented by the provincial governor.

The 2-kilometer section of road through the Municipality of Magarao was completed September 25; this connects the two sections and makes the section from Nueva Caceres to Calabanga first-class road.

A new automobile company has been formed and operates two Gramm trucks and two touring cars between Nueva Caceres and Legaspi.

ANTIQUE.

For the purpose of soliciting Insular funds as aid to provincial public works, the provincial governor and treasurer made a trip to Manila for a conference with Insular officials. The governor is especially interested in the realization of an interprovincial road between Antique and Iloilo.

Bridge-site surveys on the Egaña and Catungan Rivers are just finished. Design of bridges to be constructed on same will be requested shortly. For the agriculturists of Sibalom and Egaña these two bridges are very important and therefore a special effort will be made to build them at the beginning of next year.

The work on the Bocoboc bridge is going on. It is expected to complete this bridge by December next.

The Malandog bridge is now completed, at a cost under ₱16,000, including surcharges. It required a special effort on the part of the district engineer's office to complete the Malandog bridge for inauguration on the Fourth of July. A parade was formed, consisting of two bands, a company of Constabulary, Government officials, the schools, and the caminero organizations, which, after rounding the main streets of San Jose, made its way over 3 kilometers to the bridge. A number of addresses were made including one by Assemblyman Angel Salazar, in which the representatives of the Bureau of Public works were praised for the services rendered in the material development of the province. Heretofore, traffic has been obliged to cross the Malandog River by means of a bamboo ferry. The bridge is located 3 kilometers north from San Jose de Buenavista and is on the first-class road extending toward the southern part of the province.

built, the run to Batangas Province will become immediately very popular for autoists on account of the high land, diversified farming, and picturesque views. From the Laguna boundary to Lemery, 76 kilometers, there are no rice paddy lands such as are so common around Manila. The whole run at this season of the year is through corn, sugar, orange, and upland rice lands, and just now the views are fine.

It would seem that an extensive building program was to be in store for this province in the immediate future. A No. 10 standard plan school building has been promised for Nasugbu, a No. 7 for Balayan, and Ibaan hopes to build a No. 3. New market buildings are to be erected in Tanauan, Batangas, and Taal. Lemery is to have a fine new concrete presidencia. There is a local force available to undertake the construction of these buildings by administration, should necessity arise.

The Batangas High School now has an unusually good athletic field. It has a quarter mile cinder track, 20 feet wide, with a widened straight away for the dashes. The diamond is in excellent condition and two tennis courts are in fair shape. The permanent grand stand seats about 600 and provision is being made for handling very large crowds without allowing them on the field. The field is outlined with



Malandog Bridge, Antique Province. Hon. Angel Salazar, diputado for Antique, delivering the inaugural address.

BATAAN.

The flood on September 10 has caused considerable damage to the provincial road. Repairs will be made with the ordinary maintenance forces.

The concrete dam of the Pilar irrigation system was completed after several delays, due to the scarcity of labor at Pilar and weather conditions. Work on the canal system will be started after the rainy season. The farmers of the locality are eagerly awaiting the completion of the system.

Work on the Talisay collapsible deck bridge is well under way and will be completed in October.

BATANGAS.

Since the completion of the Bauan-Taal Road early in July, two companies have put on five passenger automobiles, and they are getting plenty of business. They make the run from Batangas to Lemery, 24 kilometers, for ₱1.25 per passenger. Several new private machines have also appeared recently. The more autos we get here the more we hear the incessant clamor for a first-class road to Manila. Out of the 139 kilometers from Lemery to Manila, all but 26 kilometers are now first class. Eighteen of these are between San José and Tanauan in this Province, the remaining 8 being between the Batangas-Laguna boundary and Calamba. It does seem a pity that Batangas should have no other overland outlet than the railroad. It is known, that, as soon as the worst sections of these 26 kilometers are

young royal palms alternated with flowering shrubs, which already add considerably to the appearance. The grounds are being maintained in good condition with 2 men employed daily and the aid of a horse lawn-moving outfit used one day each week. Funds are now available for the construction of an artistic concrete entrance and enlarged dressing rooms with shower baths. Baseball games are played practically every Sunday. Women are admitted free. The result of this has been that great crowds of women come to the ball games while their spouses are presumably at the cockpits.

The reconstruction of the provincial jail has been undertaken by administration, as bids rendered were considered excessive. The work involves about ₱7,000 worth of work in rebuilding a portion of the jail now unused and in installing a modern sanitary toilet system. The idea in reconstructing this portion is to provide room for the proper housing of the dangerously insane of the province, of which there are a large number now being confined in all sorts of places in the various municipalities.

The extraordinary rains of this season have conclusively demonstrated the futility of using adobe gravel or sand binder on what are otherwise first-class macadam roads. This has been the practice in this province, due to the fact that no good gravel was available and the provincial authorities did not care to purchase a crushing plant. The recent rains, however, have necessitated the remetaling with this class of material of all the roads at least once, one is now being resurfaced for the third time in four months, while certain sections are getting the same treatment from the second to the fifth time. Strenu-

ous efforts are now being made to procure a rock crusher to use on the unusually good quality large stone available near the beaches. It is expected that the screenings from this will stop this wholesale washing away of binding material. In all fairness it should be said that a large part of this trouble is due to wear incident to increased traffic, but there is absolutely no question as to the necessity of an immediate change in the quality of the metaling.

BOHOL.

Construction work is progressing slowly on the Loay bridge. The large swing pier has been finished for some time and the intermediate pier is practically complete. This bridge consists of a 90-foot steel span and a 165-foot steel swing span. The contractor's representative informs me that the bridge steel will arrive the latter part of October which will facilitate the completion of the bridge before March 1, 1914, the date fixed in the contract. It was found necessary to drive three extra piles in the foundation of the intermediate pier to get the required bearing. Piles driven were 11 meters long. This was not necessary on the swing pier, which was placed on 9-meter piles with a satisfactory bearing. Concrete has been placed under water with the exception of about 2 meters near the top where the water could be pumped out. A large, round, dumping bucket with a capacity of about 0.6 cubic meter has been used with satisfactory results. All concrete is mixed by a Ransome mixer. The Insular Construction Company of Manila are the contractors. When this bridge is completed, there will be a continuous road, including all structures, for a distance of 113.7 kilometers.

Concrete piles have been driven for the Tangohay bridge (five 7-meter girders) and one girder has been placed. Good bearing was obtained with 7-meter piles. This bridge will be completed about October 31.

Concrete piles are being made for the Balbalan bridge (three 7-meter girders). The abutment piles are 8 meters long and the pier piles 10. This bridge is located near Dimiao.

Structures near Duero, i. e., Itom (double 3.5 by 1.7) Tu-og (3.5 by 1.9), Lanquis (double 3.5 by 1.9), and Cabantian (4.0 by 3.5), have been completed. Also two culverts near Garcia Hernandez and two others near Tubigon.

Maribojoc market is being held up due to lack of lumber not yet furnished by the Kolambungan Lumber Company. This will be rushed to completion in a short time.

The Loon market is being held up for the same reason, but the lumber should arrive soon.

Construction of a standard school building (plan No. 7, revised), without partition and ceilings, has been begun at Tubigon. This project has been hanging fire for some months, but the lumber, for which the construction was held up, at last arrived and it is hoped that the building will be ready for occupancy by December 1.

Requisitions have been forwarded for material to construct a standard school building (revised plan No. 6) at Inabanga without ceilings or partitions. These materials should arrive in time to begin this construction as soon as the Tubigon building is completed.

No road construction is being done at present due to lack of available funds. Resurfacing is going forward on the Calape—Tubigon Road, but progress is slow due to the poor quality of stone available.

Subgrade has been built or repaired on the Tubigon—Inabanga Road to kilometer 58 and this will be advanced toward Inabanga as funds become available for the work.

BULACAN.

Contractors for the Hagonoy bridges have been granted a one hundred and ten day extension of time. This extension has been made necessary by the fact that their work on other jobs had been seriously delayed and that their equipment consequently was not available for this work.

The amount of work done on the Manila—North Road during the past quarter has been very slight. The heavy rains of this season of the year have prevented the laying of surfacing and have made it unduly expensive to carry on grading operations.

The Quingua—Pulilan Road, a first-class road 3 kilometers long, has been satisfactorily completed. The road costs a little less than ₱10,000 and is a great benefit to the residents of Pulilan who have, for some years, endured roads the condition of which during the wet season was anything but satisfactory.

Work has been begun on the Malolos central school. The plans call for a 16-room building. Thirty-seven thousand five hundred pesos have been set aside for this work, and while it is felt that this amount will hardly complete the building, it is thought that it will be sufficient to inclose it and probably to place a number of classrooms in condition for immediate classroom use.

The Bolo bridge, Allen & James, contractors, was finished about the end of September. Progress was seriously hindered by the scarcity of labor. The contractors were also unfortunate in having secured



Carts loaded with rice in bags, kilometer 52, Manila—North Road, Bulacan Province.

an insufficient supply of sand and gravel before the rains began and in losing some 50 barrels of cement during an unusually high flood. In spite of this the work done has been of a high grade and the appearance of the finished structure is decidedly to the credit of the contractors.

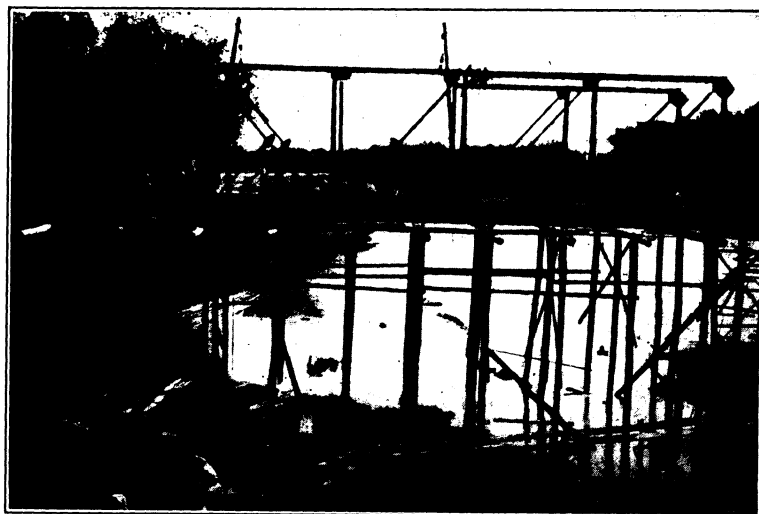
The Santa Maria market, Insular Construction Company, contractors, has been completed and is now in full use. The roofing used on this building was found to be a little under grade, and as a result it was thought necessary to paint it top and bottom with two coats of rust inhibitive primer. The building now presents an usually fine appearance.

The reinforced-concrete pile bridge over the Sapa "A" River in the town of San Rafael, usually known as the San Rafael bridge, has been completed. The contractors, Allen & James, have done an excellent piece of work, especially in the matter of the finishing of the superstructure. Progress on this project was retarded by the unusually difficult material encountered in the lower strata into which it was necessary to drive the piles. In fact, in order to secure a proper penetration, it was necessary to excavate from 1 to 2 meters below the bed of the stream. Two bents were driven in this way.

As so much excavation was expensive, it was finally decided to try to secure the necessary penetration by blasting out holes for the piles. To this end a 2½-inch hole was drilled to the desired elevation at the point where each pile was to be set and a bamboo cartridge, composed of about 3 or 4 feet of 2-inch bamboo, filled with black powder and properly sealed, was dropped into this hole and discharged. The results obtained were reasonably satisfactory for the material in which the work was done, but it is believed that ordinarily a better result will obtain through using a cartridge containing half sticks of dynamite set about a foot apart, the cartridge being from 1 to 2 feet shorter than the hole.

An interesting illustration of the economy of using Filipino foremen on public works is shown in the case of the Sapa "A" bridge near Angat, which was completed about the 15th of June at a total cost approximately 33 per cent less than the estimated cost.

This bridge is a single-span, pony truss, 52 feet 4 inches long, replacing a wooden structure of two spans of unequal length, supported by heavy adobe abutments and pier, about 7 meters above the stream bed. From all indications it seems that originally a single wooden span was built about 7 meters long, resting upon adobe abutments, but the opening was evidently too narrow, one of the abutments being washed out.



Quingua steel bridge during progress of construction, Bulacan Province.

A pier was evidently built upon the site formerly occupied by the destroyed abutment, and another abutment was built farther west, increasing the length of the bridge by one span; but even yet was the opening too small as the pier was undercut, and, about a year ago, it turned over.

The reconstruction of this bridge, therefore, consisted in taking out the large mass of masonry which the turning over of the pier had left obstructing the stream; the construction of added protection about the base of one of the abutments; the pointing up of the old abutments; the reconstruction of such parts of the old masonry walls as were visible from the road; the construction of new bridge seats on the old abutments; and the erection of the new steel span.

The estimated cost of this work was ₱7,200. As the bridge site is some 20 kilometers from the nearest railroad station, it was thought likely that administration work would prove advantageous. Hence, when no bids were received, a Filipino foreman was immediately put in charge of the repair of the abutments and the cleaning out of the old pier. This work was completed some time before the steel for the superstructure was received. When the steel arrived it was immediately taken to the bridge site and a Filipino foreman in charge of eight riveters sent out to erect it. Erection was completed without the interruption of traffic for more than three days, no American having been present on the job except for purposes of inspection and for the giving of necessary lines and grades.

The work done is first-class in every respect and the saving to the province has been very noticeable as is clearly shown by the table of costs given below:

Materials	₱2,737.40
Labor	1,340.56
Hauling and incidentals	213.64
Surcharges	557.91
Liabilities	50.00
	4,899.51
Estimated cost	7,200.00
Saving by administration	2,300.49
Per cent saved	32.08

This saving has been made possible entirely through the use of high-class Filipino foremen and serves as an illustration of what may be done in the field, using only Filipino foremen, with ordinary supervision by an American engineer.

CAGAYAN.

An appropriation of ₱10,000 has been made by the provincial board for the construction of a second-class road over the high hill just east of Claveria and the work will be started in the near future. This hill or mountain has, in the past, stood as a barrier across the only outlet for the municipality of Claveria except by the sea, which is too rough during the greater portion of the year to be navigated by a boat small enough to enter the Cabincungan River, near the mouth of which the town is situated. The construction of this road will connect the municipalities of Claveria and Sanchez Mira with a second-class road 20 kilometers in length and will permit overland traffic between Claveria and Aparri.

The concrete work on the Enrile central school, a standard Bureau of Education 3-room building, has been completed and the window frames are being placed. When completed, this will be the fourth modern schoolbuilding in this province.

Construction work on the extension of the first-class road between Tuguegarao and Alcala, which has been in progress since March 1, is, after overcoming some difficulties, now moving steadily forward.

The first course, which is composed of 13 centimeters of hard river gravel and a softer hill gravel mixed in about the proportion of 3 to 1, sets under the roller in less time than is usually required for smooth, hard gravel and, it is believed, a base as durable as if all river gravel were used is secured and at a considerably reduced cost, as the hill gravel can be secured for about half the cost of river gravel. The gravel for this course varies in size from $1\frac{1}{4}$ to $2\frac{1}{2}$ inches in diameter. The second or top course is composed of all river gravel from $\frac{1}{4}$ inch to $1\frac{1}{4}$ inches in diameter. The binder used is sandy clay.

CAPIZ.

Due to locust campaigns and rainy weather, the past three months have been slower than usual. High water and strong winds have interfered considerably with the progress of the Panitan bridge, and completion will now probably be delayed until the end of September.

On the location of the Panitan bridge now under construction, an old coconut log bridge has been annually built to accommodate traffic. It was a fair type of the old order of provisional structures. A modern steel and concrete structure is replacing it. The difficulties encountered in this construction have been extraordinary. All the false work for the two 80-foot spans was taken out by recent floods.

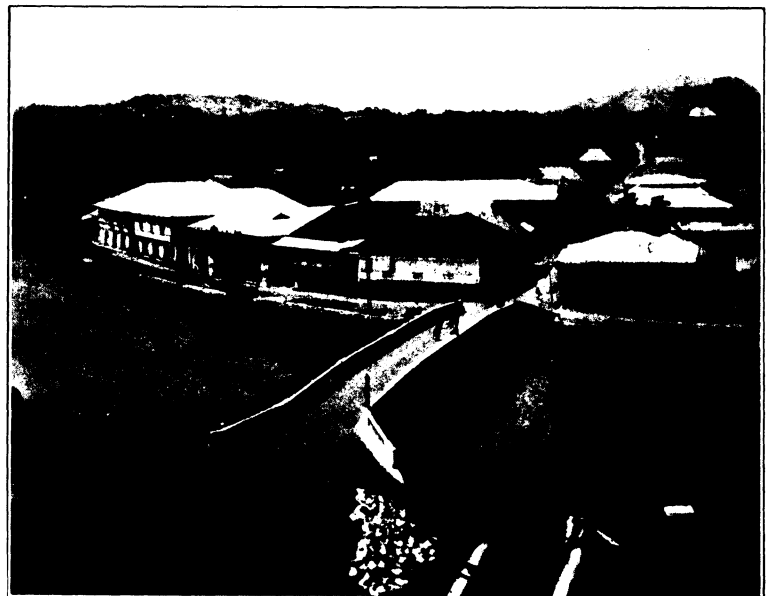
The stream carries a large amount of drift, which, if allowed to accumulate, would choke up the waterway to such an extent as to endanger the steel cylinder piers, which are set into bedrock 7 meters below the bed of the stream, and are filled with concrete heavily reinforced.

Almost every year the Panay River overflows its bank, resulting in more or less damage to the large, fertile, rice valley sections which border on it. The river rises in the mountains that form the natural divide between Iloilo, Antique, and Capiz and its length is approximately 90 kilometers. There have been a few seasons of drought, when this river was known to go almost dry and when its bed was planted in crops. Capiz territory along its banks has long been known as the granary of Panay and very seldom have the crops failed.

Advertisements for bids have recently been posted for the Calivo intermediate school, a 20-room Gabaldon building, for which sufficient funds are on hand to complete approximately one-half of the structure.

The pretty town of Romblon has one of the most beautiful and natural harbors in the Philippines. Although directly in the path of nearly all typhoons, it still continues to be the favorite refuge for all shipping between Manila and Cebu and other southern ports. The town is supplied with an abundance of good water, with good pressure in the hydrants, of which there are several public and many private ones.

The town of Capiz is constantly striving to improve, and lately an unsightly approach to the Capiz bridge has been fixed and the



The Capiz Bridge, Capiz Province.

river wall reconstructed, which has improved the plaza adjoining the bridge and fronting the high school and the picturesque old church.

The Capiz market and tiendas were turned over and accepted by the municipality of Capiz, August 14, 1913. A block of 14 tiendas was constructed.

The Busuang-Malinao Road will prove interesting on one section. What was under the Spanish régime a road with many curves and dangerously near the furious Aclan River, 2.8 kilometers in length through a low country inundated during storm periods, will hereafter be a tangent 1.6 kilometers long and will be above the usual storm inundations, and costing less than to repair the old road.

A large number of carabao are now used with plows and scrapers on the Tangalan-Ibajay Road. This is on side-hill work with boulders and rocks intermingled, where it was at first thought impossible to use scrapers.

Arrangements for the construction of the Cuartero school building have about been completed, and as soon as all the materials are delivered the work will be commenced by administration under the immediate supervision of a Filipino foreman.

Surveys and sites for markets have recently been completed for the municipality of Dao where three sites were surveyed, Panitan two sites, Pontevedra two sites, Nanga one site, Calivo two sites, and New Washington one site. Included with the survey were various estimates for fills required, cost of removing houses, and the purchase of sites.

CAVITE.

Floods have been especially numerous and exceptionally high during the months of August and September. The roads around Malabon, Imus, and Kawit have been flooded three times. The actual damage of one high water with its accompanying currents of different force does not cause very much damage. But the continuous floods, two and three each year, seriously disturb a stone macadam surfacing and will completely loosen the bond of the stone in two or three years, necessitating the relaying and rolling of the entire section affected. There are 3 kilometers of broken-stone surfaced road from Kawit to Noveleta that have suffered from these floods seven times during two and a half years. Probably 75 per cent of the stone has actually been disturbed by these floods or by passing traffic after filler is washed away. It is proposed to repair the road in good condition in this coming year and then to treat it with some asphaltic process that will prevent the overflowing water from carrying away the stone filler.

The Noveleta-Malabon section of the "Cavite boundary to Indang via Buena Vista Road" is also flooded each time that the Kawit-Noveleta is, both from the same river, but on opposite sides. This road is constructed with an adobe base and 15 centimeters of gravel. The gravel is washed away for a total distance of about 2 kilometers each year. This damage is not so serious, as the same gravel can be gathered up from the ditches and fields and replaced.

Plans and estimates have been completed for the construction of the Zapote-Binakayan Ferry Road. This is the first 5 kilometers of the Zapote to Silang Road and in its present condition is nothing but a loose sandy beach formation separating the Manila-South Road at kilometer 15 from more than 30 kilometers of first-class road to Silang. There are some heavy grades over the Banalo bridge and the railway crossing together with several sharp and dangerous curves. It is proposed to reduce these bridge and railway crossing approaches to 0.03 per cent grades and to relocate that section of the road from the bridge to the railway crossing. The total estimated cost is approximately ₱42,000.

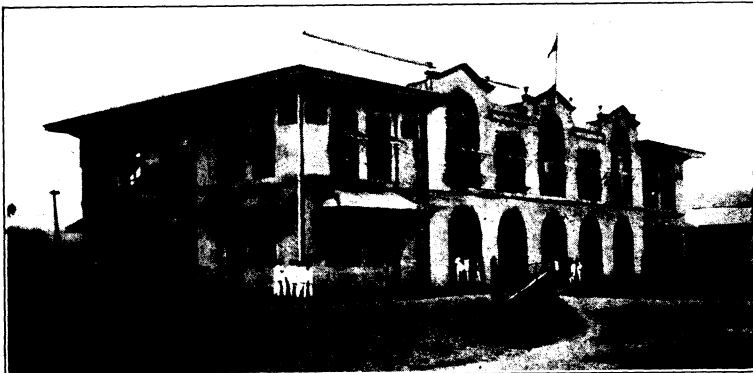
Plans and estimates for the reconstruction of the Binakayan Junction-Imus Road, 3.016 kilometers long, have also been completed and it is planned to construct this road during the coming year. As this is the most important road in Cavite Province, as far as traffic is concerned, having 120 bull carts and 250 carromatas per day, it is proposed to construct an 8-meter embankment with 5 meters in width of broken stone surfacing. The present road has an adobe base but no surfacing other than maintenance gravel. The traffic is so heavy it requires very much more gravel to preserve the adobe than it would with macadam surfacing. The cost of maintenance has been ₱600 to ₱800 per kilometer year.

In the town of Salinas-Rosario a standard plan No. 3 school building has just been completed. Owing to closeness of location to railway station, considerable was saved in transportation. The total appropriation was ₱7,500. For this sum the regular building was completed, two closets with hardwood frames and galvanized roof and sides, an additional partition in one of the end rooms, and the roof of the school together with iron used in closets given two coats of De. Co. rust inhibitive paint.

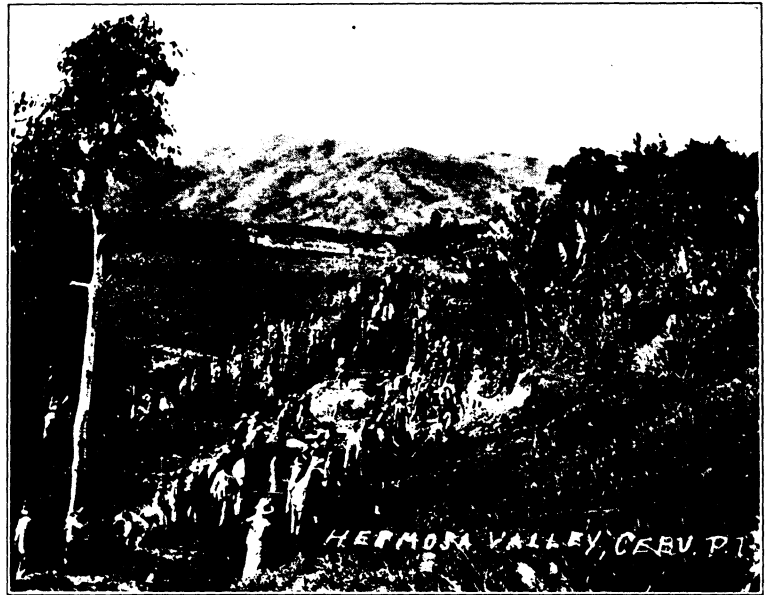
All school buildings and municipal buildings with iron roofs that show any signs of rusting are being painted with this paint.

CEBU.

The subgrade contracts on the Cebu-North Road have resulted economically for the province. It always has been the desire of the district engineer to develop a set of local contractors who could undertake small sections of subgrade construction. The contractors on the Cebu-North Road demonstrated the possibility of making money on



Cebu High School.



Road construction, Hermosa Valley, Cebu.

this class of construction and there are now several available men waiting for an opportunity to bid on such work. Large contracting firms would not undertake such small jobs, but it now seems likely that all future subgrade work may be economically let out in small sections to local people.

Work on the Barili-South Road subgrade has been suspended due to lack of funds, but the surfacing is still being placed. The road is now first class including kilometer 70.

The resurfacing of the Cebu-North and Cebu-South Roads is in full swing, three rollers being in constant use. The rock used comes from the Danao quarry, and the completed work presents an almost ideal appearance.

From the standpoint of expenditures, municipal-market construction is the most important work in the province at present. Several large jobs are in various stages of construction—Carcar and Opon are just being finished, Dumanjug, Oslob, and Dalaguete are under construction; and Barili and Arogao are just starting.

The Oslob school, Bureau of Education standard No. 7 plan, is completed and was opened with appropriate ceremonies not long ago.

The Insular Construction Company are at work on two bridges in the town of Alegria on the Barili-South Road. They are well along on the pile driving on one of the bridges and have most of the materials on hand for both jobs.

ILOCOS NORTE.

A standard plan No. 20 school building is about to be started in the municipality of Laoag. The contractor is Daniel Galza. Contract price for building complete (less four rear rooms) is ₱36,000.

The north abutment of the Laoag bridge has been completed during the present rainy season without loss or danger to the contractor.

There are now three auto trucks making regularly two trips daily from Laoag to Currimaog. In consequence the difficulty of maintaining the coral road from Batac to Currimaog is very materially increased.

ILOCOS SUR.

The Santa Maria-Soso Road is now completed. The total length of the section is 2.5 kilometers from the south end of Santa Maria to the Soso bridge. The high water of the Soso River went over this road, but has not done any damage except at both approaches of the Soso timber bridge which went out.

The road through the municipality of Santa Maria will soon be constructed with the Insular special allotment, same to be reimbursed by the municipality in question.

The Soso bridge will soon be constructed, and will consist of six 14-foot spans, timber pile bents. The pile driver is being shipped to that place by small sailing vessel.

On the Candon Road diversion part of the subgrade has been washed away, and as soon as good weather opens up it will be replaced and rerolled. The stone crusher is being installed at Bali-

ñawan, 150 meters west of the old road opposite kilometer 51. The Sorboc quarry, midway between Candon and Bucong, on the diversion has been abandoned on account of the difficulty of installing the crusher during this rainy season, and besides does not give enough stone for the road. The crusher will begin its work by the end of this month.

On the Tagudin diversion the work on the big fill over the ingot pipes is under way, and is progressing slowly due to bad weather. At the beginning of the dry season work toward the town will be commenced, and, if more money is available, work will be started on the south side of the river toward Bangar, the north boundary of La Union.

Due to the rainy season, very little work has been done on the South roads and consequently very little money has been spent.

The district engineer is making every effort to have the second-class roads through the municipalities constructed as first class at the beginning of next fiscal year. These sections should be constructed by the municipalities concerned or by the district engineer, the cost of same to be reimbursed by them. The provincial government has turned over the road work in the municipalities of Candon and Santa Maria in accordance with Act No. 443.

Topography is being taken on the Santa Lucia-Santa Cruz diversion, also borings on the Santa Cruz River bridge site, but this work has been delayed on account of frequent floods.

With the special allotment the province has at the present time, a first-class road from Ayudante (kilometer 59) to Santa Lucia (kilometer 63) will be constructed at the opening of the working season.

The city of Vigan, noted for its progressiveness toward material prosperity, is going to install very soon an electric-light plant. This proposition was promoted by prominent citizens who formed a society called "La Electricista de Vigan" with a subscribed capital of ₱30,000. McCullough & Co. sent an engineer to investigate the extension of the city, and a plant has been ordered from the States, through this firm.

For the last nine months work has been carried on on the construction of four reinforced-concrete deck girder span bridges on the Vigan-North Roads, the contract for which was awarded to Messrs. Allen & James.

The Osmeña (or Cabugao bridge) in the municipality of Cabugao was completed and opened to traffic on June 2, 1913.

The Bical and Lapog bridges in the municipality of Lapog were opened to traffic on July 1 and 28, 1913, respectively.

The Sinait bridge is a 4-7 meters reinforced-concrete deck girder span bridge with two pile cap abutments. Reinforced-concrete piles for this bridge were driven through sandy blue clay and gravel to an average depth of 5.50 meters below zero with a 1,000-kilo steam hammer, 7 meters free fall, average penetration 1 centimeter per blow.

This bridge is located in a low section of country and during floods the water overflows this section for a radius of 300 meters at an average elevation of 2.50 meters. During the baguio of July 29, 1913, the water rose to an elevation of +2.80 and bridge seat was raised from elevation +2.25 to 3 recommended. This bridge was completed by the contractor and accepted by the provincial government on September 16, 1913.

ILOILO.

Due to the typhoon of July, 1913, and the subsequent continuous rains, Iloilo has accomplished but little more than hold her own in first-class maintenance. The roads are soft and with the material at hand—river and beach gravel—it has been a difficult matter to avoid occasional mud holes. With the use of the Guimaras rock now being quarried, it is hoped later to place all first-class roads on an economical maintenance basis.

Santa Barbara school, No. 7 type, has been completed. This includes two midden sheds. No bids were received advantageous to the province, and its construction was undertaken by administration under the most disadvantageous circumstances. There was a decided shortage in lumber, cement, and roofing iron in the local markets, but with the assistance of the Bureau of Supply the work was accomplished in three months, when contractors for the Santa Barbara market, the Jaro market, and other local buildings have been delayed indefinitely on account of their inability to secure material.

The Jaro bridge was officially opened to the public on August 25. On account of the heavy fill approaches, it was found necessary for immediate traffic to lay a telford base under the gravel surfacing. This was accomplished under great difficulties due to the continuous rains. Furthermore, the district engineer's office, after much study of the situation, deemed it expedient to heavily riprap with derrick stone both abutments. The scour of the river on both sides made this imperative and greatly delayed the final opening of the bridge.

The completion of the Jaro market and tiendas has been unfortunately delayed on account of the shortage of lumber in the local mar-

kets. It is hoped to open them to the public not later than September 15.

An investigation of the old road between Cabatuan and San Miguel was made during July. Due to a shortage in provincial funds, all effort to reopen same has been abandoned for the present.

Regular maintenance on the municipal streets of Iloilo, under the supervision of the district engineer, has been continually in force. With regard, however, to the municipal streets set aside as provincial roads, the office of the district engineer has at last succeeded in contracting for the hard, blue basalt rock found on the northeast coast of Guimaras. The rock crusher was set up at the provincial building and the rock brought direct to the crusher by water. As a binder, the soft limestone found also on Guimaras has been used with excellent results. At the present writing, Calle Iznart, from Calle Remedios south to Gay Plaza, thence through Calle Real to Calle Aldeguer, has been completely overhauled. A fine macadam road is the result, which should last many years with but little maintenance.

The contract has been let to the Insular Construction Company for the Pototan market. This is of the "B" type. Work has been started on grading by administration and extraordinary efforts have been made by the contractor to have all material ready and available as soon as the rainy season is over. The work should progress rapidly when started.

Oton market and tiendas have been officially accepted by the municipality of Oton. So great is its success and popularity locally that it is necessary to take immediate steps toward its enlargement.

Like the Jaro market, the completion of the Santa Barbara market has been indefinitely postponed on account of the shortage of material in the local markets. It is hoped, however, to complete the same by September 15.



Jalaur collapsible bridge, Pototan, Iloilo.

Work on the Dueñas-Lambunao-Viejo Road has been practically stopped on account of the rains. The getting out and screening of gravel has, however, been continuous under the "paquiaio" system, and as soon as the weather permits, work will be resumed.

Work on the new Lucena-Jalaur Road has been similarly delayed. After the rainy season, graveling will be resumed and pushed to completion.

The roof of the provincial jail, now used as a storehouse, was completely overhauled during the month of August.

The Passi school building, No. 7 type, was completed during September. It is an excellent piece of work and is quite an addition to the municipality. The work was accomplished by administration.

Second-class repairs to the Iloilo-San Joaquin Road, the Cabatuan-January Road, and the Pototan-Dingle Road have been necessarily delayed on account of the bad weather.

Two 1-meter culverts of standard design were put in on the Molo-Jaro Road.

The contract for the construction of a 15-meter arch at kilometer 9.8 on Manduriao-San Miguel Road was let to A. Buchanan. The contract for the Pototan market was let to the Insular Construction Company and the contract for the new tiendas at Santa Barbara let to Lambert & Co. Work has been started on all three contracts.

ISABELA.

Construction on the Echague-Angadanan Road continues without interruption. The grading is done partly by contract and partly by administration. Contract grading costs about 60 centavos per cubic meter, while by administration the cost is ₱1 per cubic meter. Delivery of surfacing material is given entirely to individual contractors at ₱3.50 per cubic meter at a distance of 4½ kilometers, the prices

varying as the distance decreases. More than 4 kilometers have been finished, which covers the worst part of the road. On kilometer 56, the 12-meter reinforced-concrete arch over Buyong Estero is located, which was completed last June. Travelers coming from the northern towns of the province to Echague need no longer wait for the estero to dry up before they can pass with their carts and horses, as was the case formerly. The actual cost of this bridge was ₱12,673.60. This road is a continuation of the Cordon-Echague Road. In addition to the 4 kilometers completed, 3½ kilometers of subgrade is ready for surfacing. From Cordon to the boundary of Echague and Angadanan, automobile trucks for freight and passengers can be established as there is a distance of 26 kilometers of first-class road, having a total width of 4½ meters, with 2½ meters of surfacing and a uniform depth of metaling of 20 centimeters of gravel, finished with hard, volcanic earth. The average daily traffic of vehicles has doubled along this road, carrying rice, tobacco, and vegetables. The increase of pedestrians and mounted horses has reached to about 200 per cent. This 26 kilometers of first-class road traverses a section with a population of about 15,000.

The construction of the Rugao bridge has been delayed on account of an accident, failure to promptly pay laborers, and the advent of the rainy season.

The appreciation of the Cabagan and San Pablo people for a good road is far in excess of that usually shown by the people residing in other parts of the province. This unusual fact was demonstrated last July 28, when the San Pablo people celebrated their town fiesta. In spite of the rather unfavorable weather, thousands of people from Cabagan came pouring in, like clouds of grasshoppers, to San Pablo to witness the occasion. Some came on horseback, some in carts, some in carretelas that had not been used since Spanish times; but most of them, being assured of passing over a good first-class road free from mud, went on foot and arrived in San Pablo with ease and contentment, full of joy when they came, acknowledging the easy access afforded them by the new (although but partly completed) first-class road which unites the two towns. The new road is surfaced with gravel, sodded with grama grass, and planted with acacia and narra trees all along its sides. Formerly this road was impassable for horses or carts during the worst part of the rainy season, but now students from San Pablo attending the intermediate school in Cabagan return to their homes without inconvenience every afternoon during any season of the year. The road is being economically constructed, ₱1.50 being the cost of a cubic meter of gravel placed on the road, with a haul of 1½ kilometers. The surfacing materials are delivered by contract. The road has a 2½-meter width of surfacing, placed 20 centimeters deep. Two kilometers of surfacing have been completed and another kilometer of subgrade will soon be ready for surfacing. Grading is costing ₱1 per cubic meter. The traffic is rapidly and continuously increasing, and this increase will certainly be greater as soon as the road is entirely open to traffic. About 6,000 people are directly benefited by the road and the products passing over it consist mostly of tobacco, corn, and merchandise. As soon as the road is entirely open for traffic a train of cars hauling water will undoubtedly follow, for the people of both towns appreciate the water of the Pinacanauan for drinking purposes. The farms all along this road are, each and every one, under cultivation. Corn, which is generally grown twice a year, is planted everywhere. Tobacco, the principal and most important marketable product of the locality, is grown during one season of the year.

LA LAGUNA.

The resurfacing of the Santa Cruz-Pagsanjan Road, begun on July 16, has been completed for 3½ kilometers, leaving only 1 kilometer yet to be done. Work has been delayed both by lack of railroad transportation of stone from the Los Baños quarry and by the loss from surra of the mules employed in hauling the stone from the railroad to the highway. Carts have been secured and the work is now being carried on as rapidly as the stone deliveries permit.

A survey of the Santa Cruz station, beach, and cemetery roads has just been completed, and ₱3,000 road and bridge funds voted to begin construction work in the near future. This amount will place the road between the town plaza, the railroad station, and the provincial building in good repair, and funds will be allotted in next year's budget for the completion of the work to the boat landing or beach, and to the cemetery on the Pila Road.

Repairs on an old adobe bridge at Cavinti have just been completed. The bridge has two arches, one of 11-meter span and the other of 6, and the roadway is 9 meters above stream bed. The road surface and mortar backing had worn off until a large part of each arch was exposed and, being built of ordinary adobe stone 20 by 20 by 50 centimeters, with a thickness of only 20 centimeters, it is remarkable that it continued to stand.

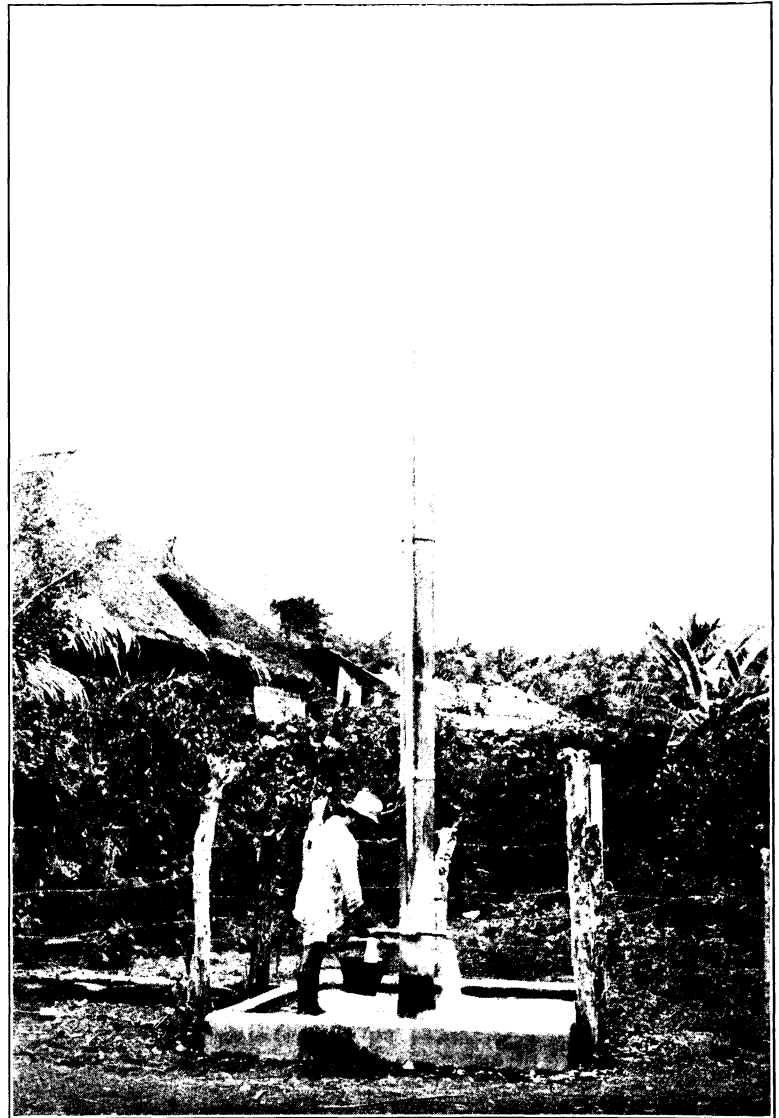
The cement used was taken from the barrels in Pagsanjan, sacked, and transported on pack ponies some 8 kilometers to the site of the work, while the sand was secured by reducing to a powder a kind of adobe rock found in that vicinity, there being no other sand available

nearer than Pagsanjan. Stone for concrete and adobe stone were found on the site. The work cost approximately ₱2,000 and has preserved a bridge for many more years service to replace which would cost, on account of its isolated and inaccessible location, probably ₱30,000.

The storm of September 9, 10, and 11 did considerable damage to the San Pedro Tunasan-Calamba section of the Manila-South Road, and slight damage on the Santa Cruz-Pagsanjan road. Repairs were begun immediately, and practically all the damaged sections have been repaired.

Work on a standard-plan market, 18 by 38 meters, at Nagcarlang, is being pushed vigorously and it will soon be completed ready for occupancy, although there remains considerable grading to do to put the market grounds in proper condition.

Grading for a 10-room standard Bureau of Education building has just been completed and concrete footings for columns poured.



Artesian well at Santo Angel (barrio), Santa Cruz, Laguna.

Prosecution of work in Nagcarlang is very difficult owing to the extreme scarcity of labor, the isolation of the town during the rainy season, and the inclement weather experienced during the past six weeks.

Progress on the Laguna high-school building at Santa Cruz has been delayed on account of bad foundations encountered and the consequent necessary change in footings.

Plans for the José Rizal Memorial School at Calamba are being prepared in the office of the Consulting Architect.

Two new market projects have been added to our list, one at Biñan and one at Calamba, but both are dependent for construction on Insular loans.

Construction of waterworks and market at San Pablo is delayed, pending receipt of Insular loans already authorized.

Investigations have just been completed for the construction of a steel-truss bridge across the Balanac River at Pagsanjan to connect the railroad station with the town. The truss or trusses will be donated by the Manila Railroad Company, while the piers and abutments will be constructed by the municipality from funds provided by an Insular loan. The trusses to be used were recently taken from the Calumpit bridge on the north line. Stone was found at depths of 5 to 7 meters, but it was impossible to penetrate it at that depth with the Standard test-boring outfit.

The output for the Los Baños quarry for the quarter ending June 30, 1913, was 6,744 cubic meters, which was sold for ₱20,232. It is estimated that the output for the quarter ending September 30 will be 4,311 cubic meters of which 2,760 cubic meters produced in July and August sold at ₱3 per cubic meter, or ₱8,264, and 1,551 cubic meters produced in September sold at ₱2.20 per cubic meter, or ₱3,412.20, making an estimated total of receipts for output for the quarter of ₱11,676.20. The reduced output for this quarter was due primarily to a lack of demand during July and August, although the storm on September 9, 10, and 11 materially affected the output by loss of time during storm and the derangement of car service by reason of the damage done to the railroad. With the reduction of the price to ₱2.20 on September 1, sufficient orders were received to keep the quarry busy for the next four months. At this date, September 25, the car service is better than it has been for a long time and the officials of the railroad company assure us that it will continue to improve until we get all the cars we can load.

The results obtained from the load tests for bearing power of the soil at the site of the proposed provincial school building at Santa Cruz, Laguna, clearly indicate the danger of resting the foundations of a building on engineering judgment or "horse sense," when based on a superficial investigation.

For this test a hole about 75 centimeters square and 50 centimeters deep was excavated. A timber block, 50 by 60 centimeters, was bedded in 2 centimeters of sand to give even bearing. Girders, carrying a platform, rested on this block. Levels were taken at the four corners of the platform after each increment of load had been placed. Sand, in sacks, was used for the load.

The soil exposed by the excavation was a compact sandy loam, free from decayed vegetable matter. A bearing value of 7,500 or 8,000 pounds per square foot was expected. Under a load of about 2,500 pounds per square foot the platform settled until the girders carrying it rested on the ground.

The reason for this result was partly shown by the test borings, which were made with the 5-centimeter rig. The stratum of sandy soil was only 1½ meters thick and was underlaid by 2 meters of soft muck.

In a similar test at a second site in an old graveyard, where the surface material and muck had been well mixed, failure occurred under a load of 1,300 pounds per square foot.

LA UNION.

The Naguilian-Ripsoan Road has progressed steadily the past three months. Almost all of the ₱10,000 which was set aside for this road has been expended. About 6 kilometers have been covered with first-course gravel and rolled. Two kilometers have been covered with 2 and 3 inch finished course. There is need of the construction of permanent culverts on this line. After each baguio during the past rainy season several of the temporary culverts were entirely washed away.

The Naguilian bridge as well as the Bauang collapsible bridge was floated off during the baguio of July 28-30. The current in both cases, with the great amount of floating logs, caused the stringers to break away from the 1-inch cable which had been secured to dead men. At Naguilian the center of the bridge, over which the stream passed with the greatest velocity, went off first, dragging the ends off later. This force produced too much pressure for the half-inch cable which connected each stringer and so the flooring and stringers, with the exception of the two end stringers which were secured to the 1-inch cable, were washed out to sea. Fortunately a southwest wind washed all the timbers up on the shore, and not one was lost. They were scattered as far north as Camp Wallace, near San Fernando. The river at Naguilian has washed the bank out westward about 250 feet, leaving an unbridged section. This will be spanned by 12 new bents as soon as the necessary materials can be purchased.

The west wing of San Juan schoolhouse is being constructed. The walls were built some years ago, but the roof was not added, more room at that time being unnecessary.

Work is being started on three new concrete culverts on the San Fernando-Bacnotan Road. These culverts were originally Spanish structures and were washed out during the big baguios of 1911.

The municipality of San Fernando has begun to clear away the market site for the proposed new market buildings. Construction work on this project will be begun some time during the coming season.

LEYTE.

During the past three months no severe baguios have occurred, but on July 14 a rainfall of 9.9 inches in twenty-four hours was recorded by the observer at Tacloban. This is a greater fall for a twenty-four hour period than has been recorded here since the establishment of the local observatory. In the mountains the fall no doubt was greater. This was augmented by about 2 inches on the following day, causing all the lowlands to be swept by floods which did considerable damage to the roads and temporary bridges. The wooden bridges at Tunga and Mainit (Tacloban-Carigara Road) were carried away and the road more or less damaged all the way from kilometer 25 to kilometer 53.

The Tanauan-Dagami section of the Palo-South Road suffered severely, water being over the road in places 40 centimeters deep, between Tanauan (kilometer 19) and Malaguikay (kilometer 22), and being over 1 meter deep from kilometer 22 to kilometer 30. The part of this section that had just been resurfaced (kilometer 19 to kilometer 26) held remarkably well but raveled somewhat in places. The greatest damage was done from kilometer 26.5 to kilometer 29. This part had not yet been resurfaced, but the gravel to do the work had been deposited along the shoulder and about half of it was carried into the fields. Also, there were several washouts. The boiler and crusher on the edge of the Burauen River (Burauen-Dulag construction) was turned completely over and the crusher buried under 1 meter of sand and gravel. An anvil, 9 car wheels, and other equipment were carried away or buried under the sand and gravel. One thousand four hundred cubic meters of crushed stone was carried downstream, of which less than 200 meters was recovered. The tramway leading from the road to the crusher had to be relaid in places. The water causing the damage to the Tanauan-Daraga section is the overflow from the Binaha-an River which runs approximately parallel to this section touching it at Cansamada (kilometer 29) and Guingauan (kilometer 26.5) and crossing the road at the barrio of Kalog-kog (kilometer 16.8). After considerable investigation it was found that by making an opening in the bank at the barrio of Way-way, between Pastrana and Dagami, about half of the Binaha-an's water could be diverted into an old channel which leads into the Gangsan River which flows into the Binaha-an again near kilometer 21. By doing this the high water at kilometer 29 and kilometer 26.5 will be eliminated and no further encroachments by the river need be feared at these points. The old channel into which the water will now be turned was formerly one of the courses of the river, but in Spanish times it was dammed in order to make deeper water in the Binaha-an, as the only means of getting from Dagami to Tanauan in the rainy season was by baroto on the river. On account of the tortuous channel it took five to six hours to go from Dagami to Tanauan. The return trip against the current took from twenty to thirty hours. The same trip can now be made by auto in less than half an hour.

The work of diverting part of the water back into its old channel has been commenced. Its estimated cost is ₱400.

MISAMIS.

The reconstruction of the 3 kilometers on the Cagayan-Dock Road has been completed, which makes this a first-class road in every respect. From outside to outside of ditches is 15 meters, with a 4-meter gravel surface. Surfacing was done in the following manner: What was left of the old surfacing was picked up, realigned, and crowned, then wetted down and rolled. Ten centimeters of gravel from 1½ to 2½ inches in diameter was placed and well rolled, followed with an 8-centimeter second course of gravel ¾ to 1 inch in diameter. After being well rolled, the gravel screened out of that used in the first and second courses was then placed over the entire surfaced road 3 centimeters deep, using same as a binder. Trying to pack this was very much like trying to pack a sack of beans. Coral stone was then broken into pieces 15 centimeters in diameter, and a strip 2 meters wide and 30 centimeters deep crushed on a hard surface by running the roller over same four or five times. This crushed coral was then used as a binder with very satisfactory results.

The steel bridges, one of which is completed between Aloran and Oroquieta, are being newly painted, after the old paint is removed.

The contract for the construction of 15 culverts ranging from 1: meter to 5-meter spans, between Jimenez and Aloran, was completed September 18. This work required four months and twenty days to complete, at a cost of ₱10,988, the province furnishing all steel and cement. Puddle dams had to be constructed around both ends of nearly all of these culverts. The cost of gravel and sand ran from ₱2 to ₱4.50 per cubic meter. Cement and steel were hauled over a very bad road as a result of the heavy rains. Two barrels constituted a load, and partially accounts for the high cost of this work.

The work on the Cagayan-West Road is progressing quite rapidly. During Spanish times this was a third-class road which was allowed to deteriorate until it became impassable. Since January 1 of this year, one 1.5 by 1.5 standard concrete culvert, and seven concrete pipes

have been constructed, three wooden bridges reconstructed with molave lumber delivered at the bridge site at ₱180 per 1,000 feet. Nipa roofs cover each bridge. Eight kilometers of road are ditched, graded, and patched and are now open to traffic. The available funds and the present traffic do not justify constructing a first-class road at this time. It is planned that when the road is open to traffic as far as El Salvador, to start at Cagayan and construct a first-class road as funds are available. Several heavy fills must be made through a country that is overflowed by the tides on this road.

The center pier is finished on the Jimenez bridge and the driving of the sheet piling in the cofferdam for the west abutment is under way. Lumber is being delivered by the contractor at a slow rate.

Materials for the Agohó school building have been ordered and work will start as soon as same is received. This is to be a plan No. 2 building.

NUEVA ECIIJA.

Two kilometers have been completed on the Cabanatuan–Aliaga Road. This road is in the overflow of the Rio Grande which overflows annually. Funds were not sufficient to admit of the construction of an asphalt or cement road. The ordinary gravel macadam construction was therefore employed. The subgrade was constructed without any crown. Shoulders 20 centimeters high and 1½ meters wide were placed on both sides of the road and planted with Bermuda grass in order to form a sod on both shoulders and slopes before any metaling was placed. To prevent water from standing on the subgrade, it was necessary to cut small ditches about 10 centimeters wide and 20 centimeters deep in the shoulders in order to let the water drain off.



Driving piles on the construction of the steel bridge over the Baliuag River on Baloc–San Juan Road, Nueva Ecija.

These drains were kept open until the surfacing was in place and were then filled with large stone and covered with earth and sod. The surfacing was placed without crown, and the grass from the shoulders was allowed to grow into the edge of the metaling for a width of about 10 centimeters on both sides. This tied the metaling and subgrade together in such a way that water will pass over the road without any damage to either subgrade or surfacing, and it is believed that this class of road will stand in any place (after the shoulders and slopes are sodded) where the water does not parallel the road and where the current is not more than 6 feet per second. If roads are to be constructed where the ground will be overflowed during the floods, they should be so located that the water will pass over the depressions at an angle of at least 30°.

Two and one-half kilometers of subgrade have been completed on the San Isidro–Pampanga Boundary Road, but, owing to shortage of labor, work was suspended until after rice planting is over.

Surveys and estimates have been completed for every important road in this province, except on the relocation of a small portion of the Manila–North Road between San Juan and the Pangasinan boundary, and the survey on this section will be completed by September 10, 1913.

The Manila–North Road is the most important project in this province and has been constructed with funds allotted from Act No. 2264 and from provincial road and bridge funds. Work on both ends is being pushed as fast as funds and labor conditions will permit. Nine and nine-tenths kilometers have been completed on the Gapan–Bulacan section; grade completed 36 kilometers north of Cabanatuan; surfacing completed 30 kilometers north of Cabanatuan; and work is now in progress on the construction of the subgrade

between San Juan and the Pangasinan boundary. The following data on increased revenues, products, and population show what great benefit this road has already been to the Province of Nueva Ecija. The road and bridge receipts of the Province of Nueva Ecija during the period from January 1 to August 31, 1913, reached the sum of ₱75,474.02, as against ₱57,707.94 for the same period of 1912, an increase of ₱17,766.08. The collections so far made (eight months) have exceeded the total collections for 1912 by ₱4,354.27. To the activity in the sale of cedulas this increase is largely due, showing an increase of 8,885 cedulas over the same periods last year. If the total number of cedulas sold during the past eight months is compared with the sale during the entire year of 1912, we find that we have already sold 7,403 cedulas more than last year. In money the increase to date represents ₱11,533. Another source of revenue which shows a decided increase is "road toll." These collections jumped from ₱2,322.91 in the first eight months of 1912 to ₱6,733.35 for the corresponding period of this year, an increase of nearly 200 per cent. Land taxes also show an increase of ₱1,722.67 as compared with last year's figure. If immigration is encouraged in the future as it has been in the past, there is every reason to believe that the road and bridge receipts for the Province of Nueva Ecija will in 1914 reach the ₱100,000 mark.

Rice production of Nueva Ecija.

Municipalities.	Fiscal year—	
	1912	1913
	<i>Cavanes.</i>	<i>Cavanes.</i>
Aliaga	55,445	233,474
Bongabong	73,200	60,000
Cabanatuan	38,000	140,000
Cabiao	25,000	125,000
Caranglan	7,000	21,720
Cuyapo	215,017	449,560
Gapan	25,000	125,000
Jaen	18,913	166,443
Licab	20,000	300,000
Lupao		47,026
Muños		30,000
Nampicuan	204,030	500,000
Pantabangan	65,000	7,000
Peñaranda	470	34,700
Rizal		9,000
San Antonio	8,000	90,190
San Isidro	2,239	102,600
San Jose	401,120	254,640
San Juan	232,423	470,000
San Leonardo	20,000	50,000
Santa Rosa	11,100	157,200
Santo Domingo	25,151	104,000
Talavera	1,269	73,367
Zaragoza	8,000	114,600
Total	1,456,347	3,665,520

Population of Nueva Ecija.

Municipalities.	Fiscal year—	
	1912	1913
Aliaga	12,368	14,598
Bongabong	8,002	6,500
Cabanatuan	7,429	10,500
Cabiao	8,401	8,681
Caranglan	1,305	1,304
Cuyapo	17,132	16,292
Gapan	12,561	13,000
Jaen	4,465	4,465
Licab	8,000	6,362
Lupao		4,805
Muños		5,590
Nampicuan	4,180	4,187
Pantabangan	1,130	1,151
Peñaranda	8,408	8,470
Rizal		4,115
San Antonio	6,787	7,422
San Isidro	11,524	11,732
San Jose	10,549	11,610
San Juan	11,579	9,700
San Leonardo	6,000	6,119
Santa Rosa	3,979	4,207
Santo Domingo	4,576	4,581
Talavera	3,409	4,447
Zaragoza	7,004	7,004
Total	158,788	178,841

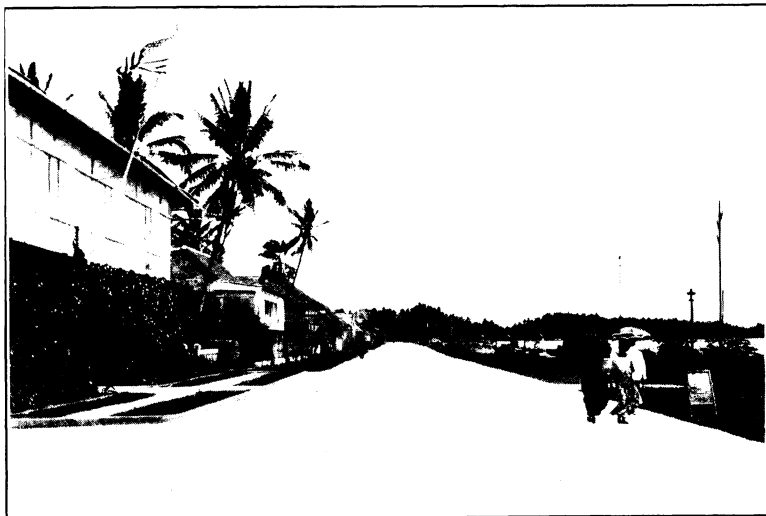
From the above tabulation it can be seen that 119,400 people are benefited by the construction of the Manila–North Road in this province, and that 2,299,000 cavanes of palay were produced last year in the towns along this road. Of this amount of palay, 597,000 cavanes were consumed by the producers and 1,702,000 left for export, which without a road would cost 60 centavos per cavan to transport to market, equivalent to ₱1,021,200 in transportation cost, but with the road this can be transported to market for 30 centavos per cavan, representing a saving of ₱510,600 per annum to the farmers. Traffic

has increased nearly 300 per cent on the completed section of this road, and if the farmers are able to harvest a fair crop from this year's planting another increase of at least 100 per cent in traffic and products will develop. From the above it can be seen that an excellent field is being opened for the use of automobile freight trucks. Owing to the excellent condition offered to farming in this province, labor for road work is always scarce and for this reason the provincial board has requested the Bureau of Labor to assist in furnishing labor for road construction in the province. Special mention is due the provincial treasurer of this province for assistance in securing the above data and the interest he has taken in the construction of roads and bridges along approved lines.

OCCIDENTAL NEGROS.

Active construction by administration has been inaugurated on Bago central school, a standard plan No. 7 building. It is intended to "paquiao" practically the entire work. Construction proceeds slowly, owing to shortage of materials. The difficulty in obtaining materials from Manila constitutes a very real handicap and renders costs considerably in excess of like work in more fortunate localities.

The heavy rain of the latter part of July damaged the southern roads considerably. At Tanolo bridge, south of Hinigaran, the long approach fill on the north was again cut through after having been replaced for a similar result of last year's baguios. Appearances indicate that the sand bar thrown up by the southwest monsoon backs up the river to such an extent that the surrounding country is inundated and that the wide range of tides creates swift currents which rapidly erode the embankments.



Kilometer 1, Dumaguete Road (first class), Oriental Negros.

It has been suggested that a canal might easily be cut to relieve the pressure in flood time on the Tanolo River by shunting a portion to the Hinigaran River. It is doubtful whether the desired end could be obtained in that manner.

Surveys have been made for modern market sites in San Carlos, Saravia, Silay, Bacolod, and Isabela. Contours to two-tenths of a meter were shown.

No work has been done on Hinigaran market, as a change of location has been ordered. Work on the La Carlota market and tiendas is approximately 75 per cent complete.

A 2 by 1.5 and a 5 by 2 standard box culvert were completed July 12, 1913, on the Bacolod-North Road, Manapla-Cadiz section. The province furnished cement and steel and Mr. W. S. Berlew contracted all other materials and labor. Total cost, ₱3,630.49.

Alimango bridge, a reinforced-concrete pile structure of three 7-meter standard spans, was completed August 6, 1913, by the contractors, W. H. Lambert & Co. Total cost, excluding approaches and surcharges, ₱10,467.24.

The province, in addition to the White touring car now in use, is to purchase a runabout. The new machine will be used by the district engineer's office and should make for increased economy and efficiency.

The cadastral survey of this province, which is at present under way in the municipalities of Bacolod, Murcia, Bago, Villadolid, and La Carlota, has brought up many questions as to road locations and has afforded this office, through the courteous consideration of the officials in charge of the survey, an opportunity to definitely settle the right of way question as the work proceeds.



Kilometer 17, Tanjay-Bais Road, under construction, Oriental Negros.

ORIENTAL NEGROS.

The contract for furnishing structural steel for the Ocay bridge has been awarded to the Atlantic, Gulf and Pacific Company. Total cost, approximately ₱8,750. Bids will soon be received for constructing the concrete substructure and erecting the steel superstructure. This bridge is to consist of a single 160-foot steel truss span with a wooden floor, on concrete abutments with pile foundations. It will replace a three-span, reinforced-concrete arch bridge, destroyed by the typhoon of November 28, 1912. (See page 29, July 1, 1913, issue of the QUARTERLY BULLETIN.)

Preliminary plans for the Dumaguete market have been received and approved by the municipal council. The building selected is of the closed-court type, 21 by 43.5 meters in plan. A loan of ₱20,000 from Insular funds has been secured for its construction.

Progress on the first-class road from Dumaguete north has been very slow for the past two months, due partly to rainy weather and partly to shortage of labor. Construction is going on at present in kilometers 21 and 22. The subgrade of these kilometers consists mostly of clay, making rolling almost impossible when it is wet. Nearly all work is being done by "paquiao." The subgrade gang is allotted a certain number of cubic meters daily, the amount per man depending upon the ease with which the dirt may be handled and the length of haul. First-course rock is being bought at the side of the tramway for 50 centavos per cubic meter. Coral "gaay" for the second course is also being screened and hauled under this system.

Governor Fugate has just completed another concrete bathhouse on the Island of Siquijor. This one is located in Larena, and has four rooms, with a 2,000-gallon concrete tank overhead.



Kilometer 45, Bais-North Road, Oriental Negros.

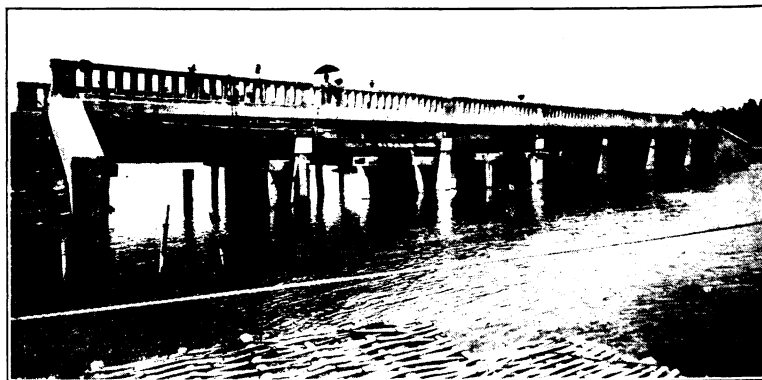
PAMPANGA.

Work on first-class road construction has been stopped since the middle of July because of the constant rains. The organization is being kept intact but somewhat reduced in numbers, and is occupied with ditching and subgrade work and the hauling and placing of stone preparatory to continuing the surfacing when the rain let up.

The province owns a considerable amount of tramway which has always been assigned to rock-crusher and road-surfacing work. As years of rinderpest have made carabao scarce, hiring carabao is a very unsatisfactory method of transportation in this district. Constant interference of the work by quarantines, rice plantings, and harvests are also encountered. For these reasons tramway has been considered perhaps the most economical means of transporting road material where distance and quantity enter into the problem. Economy is favored by the fact that practically no rising or falling grades exist over which material must be hauled on any of the roads which are to be surfaced. In the past gasoline and petroleum locomotives have been used for motive power on long hauls and have been worn out in the service. At present mules are being used, but are limited as to speed and power besides requiring more men. Therefore the province has under consideration the purchase of a small saddle-tank steam locomotive for this purpose. Considering grades and long hauls there are some 50 kilometers of roads next in order to be built on which a locomotive of this sort would probably give good service.

A section of road giving a good test of the value of sodding on shoulders and slopes is that in the town of Lubao, kilometers 17 and 18 of the San Fernando-Lubao Road. This road was built in January, 1911, and since then has been overflowed many times by the floods in the Porac River. As there existed an old grade, well raised above the rice paddies, it was not constructed as a standard overflow section it being considered safe from high water. About six months after construction, during the destructive storms of July, 1911, the road was overflowed for more than 1 kilometer of its length and badly damaged by the cutting away of the downstream shoulder. It was repaired immediately, particular care being taken to sod the slopes and shoulders with thick sod well rammed into the soft earth embankment. As it was in the middle of the rainy season a thick mat of grass immediately grew. Hardly was the work completed when other baguios came, flooding the same section to a depth of 2 feet or more in some places. There was an extremely rapid current, due to the drop in the water level of some 2 feet at the lower side of the road, but the only damage done was the loss of the binder off the metaling from the crown to the downstream shoulder. Since that time this road has been overflowed several times, but never with any damage except to the fine material on the surface. The recent storms have just repeated the performance described and repairs to the road are to be undertaken as soon as the lowering of the floods in the rivers allows gravel to be obtained.

The rainy weather and the scarcity of labor during the rice-planting time have caused a big decrease in the output of the two contract rock quarries on Mount Arayat. Several thousand meters are on



Concrete bridge on kilometer 4, San Fernando-South Road. Pampanga Province.

hand, however, ready for use and there will probably be no delay in road construction due to shortage of surfacing material.

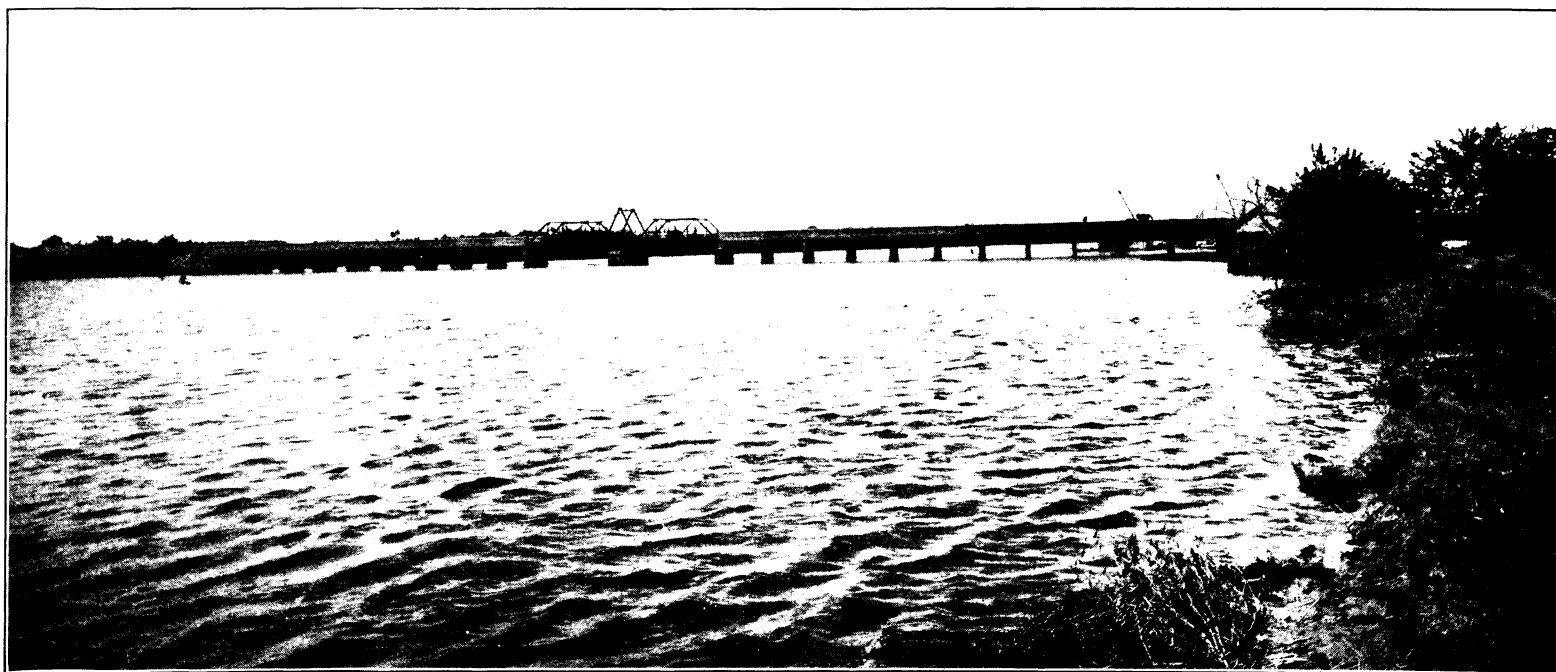
The levee along the Rio Grande de la Pampanga has been endangered once lately by the high waters. The levee has a top width of from 4 to 7 meters in its different parts and a height of from 2 to 10 feet. It is used as a road, it having been constructed on a road right of way. It has a total length of about 40 kilometers. Pressure and seepage cause very little danger to the levee because of its width and the nature of the material of which it is constructed, it being heavy sticky clay. However, the river is cutting its banks continually and at times lets long sections slip into the water to melt away in the rapid current. One of these slides occurring at a point where the levee stands close to the water edge would leave a crevasse that could not be filled by methods available, and the intruding current would be deep enough to cut up the surface of the country badly in addition to flooding for an indefinite time some very valuable crops.

The work on the Guagua market and school is progressing nicely. When they are completed this town will be equipped with two modern public buildings of first-class construction and excellent finish throughout.

The Macabebe market building is being built by contract. The slow rate of progress and poor work has required that something be done, and the job is now practically in the hands of the district engineer for completion, the provincial treasurer acting as disbursing officer for the contractor, who seems willing for his business to be handled for him in this way.

PANGASINAN.

The first typhoon of this year struck this province on July 29, 1913, and continued for three days. It destroyed bridges, roads, and dikes to the value of ₱38,000. Practically the entire central



Calmay Bridge, Pangasinan Province.

and eastern parts of the province were under water. Crops and buildings were damaged extensively and six persons were drowned. During the entire month the rivers continued high, permitting of very little repairs or reconstruction. On September 4 another typhoon struck the northern part of Luzon, continuing only twenty-four hours, but was of much greater force than the first one. This typhoon also covered the province with water damaging roads, bridges, crops, etc., and destroyed all work of repairs which were in course of completion on former damages. The total damages to provincial public works on September 4 remained ₱38,000, as all repair work was again destroyed. During the month of September water continued high in the rivers and up to the 15th, the central part of the province was under an exceptionally high flood.

Governor Calvo has originated the scheme of maintaining quarters in the municipal buildings for the accommodation of visiting officials and strangers.

It is the intention of the provincial board to asphalt all those sections of first-class road subject to heavy flood overflow. Sections subject to light overflow will be oiled.

The municipality of Binalonan has requested a loan of ₱60,000 for the construction of a bridge estimated at ₱120,000 across the Agno River. They ask aid of only ₱45,000 from the province and Insular Government.

The municipalities of Binalonan and Lingayen have entered into contract with the Insular Construction Company for type "B" markets with tile roof, the price to Binalonan being ₱16,750 and to Lingayen ₱16,950.

Dagupan is to construct a type San Roque market at a total contract price of ₱22,400.

An athletic field and baseball diamond is being constructed in Lingayen by the district engineer for the use of the public schools.



Junction-Montalban Road, Rizal Province.

This, with tennis courts and golf links, will form part of the proposed capitol park.

The Rosales-Binalonan Road, a section of the Manila-North system, has been completed.

RIZAL.

Since the oiling of the Manila-South Road last year cost data on maintenance have been kept for the oiled and water-bound sections from kilometers 12 to kilometers 28. Of this section kilometers 18 and 25 were left water-bound for the purpose of observation and comparison. It will be noted that the traffic on this section is mostly automobile.

The average cost of the maintenance of the 15 kilometers of oiled section was ₱703.80 per kilometer, while that of the 2 water-bound kilometers was ₱539.47. It is believed that the maintenance cost of the oiled section shown is somewhat greater than it should be, owing to the fact that a number of holes developed throughout the road which had to be patched with oil, the cost of patching with oil greatly exceeding patching the water-bound kilometers. However, even with the greater cost of maintaining the oiled section over the cost of maintaining the water-bound section, the ultimate economy of oiling the road was illustrated in the last bulletin, where a graphic comparison was made between the wear of the oiled section and the water-bound section. This difference of wear is even more apparent near the city of Manila where the iron-tire traffic exceeds the auto traffic by approximately 2,000 vehicles per day, while the relative cost of the maintenance of the oiled and water-bound roads are as given. It is believed that with a yearly application of oil the cost of maintaining the road will be no more than the cost of the oiling, which is about ₱450 per kilometer plus the cost of keeping the grass cut, while from observations made so far the surfacing should wear twice as long as that of the water-bound road.

Subgrade on a second-class road from Angono to Binangonan, along the shore of Laguna de Bay, a length of 8½ kilometers has been

completed. Two temporary bridges have been constructed and upon the completion of the third bridge the road will be open for traffic to Binangonan.

The alignment and reconstruction of the Pasig-Manila Road through the Fort McKinley reservation has been completed. The metal was laid to a width of 5 meters over the new subgrade, which has a length of approximately 1½ kilometers. The cost was ₱6,000.

A serious erosion of the banks of the Mariquina River at kilometer 23, Manila-Montalban Road, has several times closed the road to traffic. A new road has been built around the washout at this point.

Twenty-five thousand pesos has been made available for the construction of a high-school building in the town of Pasig.

A park and kiosks are to be constructed in Antipolo during this dry season at an estimated cost of ₱24,000. There is now available ₱10,000 for the construction of the Antipolo market and ₱6,000 for sanitation and public works.

A second-class road from Novaliches to San Jose is now being constructed.

SAMAR.

After many delays the Calbayog-South Road has been completed to the Gandara River. Great difficulty was experienced in rolling the subgrade in kilometer 21, as the excessive rains of July so softened the fill through the Bachow swamp, that the road roller would bury itself in the soft earth. It became necessary to use planks under the road roller for the first rolling of this section. Another cause of delay was the scarcity of labor, a difficulty which was finally overcome by importing laborers from Leyte Province.

Work is progressing satisfactorily on the Calbayog-North Road. Unlike the Calbayog-South Road, labor on this road is plentiful. The grading work has been completed to Sabang, a distance of 7 kilometers, and 2.5 kilometers of first-course surfacing placed. Three of the seven culverts to be built on this road are completed.

The municipality of Calbayog has appropriated ₱2,000 for the resurfacing of the First and Second Streets through the business portion of the town and placed the project under the supervision of the district engineer.

Plans and estimates have been prepared for five concrete bridges on the Calbayog-South Road and one bridge on the Calbayog-North Road. They are all to be of concrete pile construction with the exception of one concrete girder bridge of two 12-meter spans. These bridges are to be immediately advertised.

Work on the artesian well, which is being drilled at Villareal, was delayed nearly two months because of the loss of the drilling tools. The cable parted allowing the tools to fall 500 feet in a dry hole. After considerable difficulty the tools were regained and the work is progressing. The well has now reached a depth of 955 feet without obtaining a sufficient flow of water.

Considerable difficulty is being experienced in obtaining land for a market site at Calbayog. The only feasible site is owned by several individuals, who have placed a prohibitive price upon the property, and all efforts at compromise have failed. It is believed that the municipal authorities will be compelled to resort to expropriation proceedings.

In July three-fourths of a kilometer of first-class road was completed at Zumarraga on the Island of Buad. This was constructed of two courses of hand-broken coral rock with a binder of coarse beach sand, all compacting being done by tamping.

A breakwater is being constructed to protect the causeway on kilometer 17 of the Borongan-San Julian Road. This causeway has been injured by every severe storm since its construction in 1909. It is believed that the resultant saving in repairs will amply justify the construction of the breakwater.

The labor contract for a standard No. 7 school to be erected in Catbalogan has been awarded to Mr. O. Stephens for ₱4,200. Construction will be begun in October.

SORSOGON.

The storms of July and August washed the surfacing on the first-class roads and caused the destruction of one old 2-meter culvert on the Sorsogon-South Road. The roads have, however, been restored to a good condition all over the province.

Grading on the Sorsogon-South Road has been completed as far as Gubat and only about 3 kilometers of surfacing are lacking. Bridge work has been resumed on the section of this road between Gubat and Bulusan and it is expected that traffic will be able to pass without interruption as far as kilometer 37 by the end of this year.

The Bulan-Irocin bridge project has steadily, although rather slowly, gone ahead and should be completed in a month.

The construction of the extension of the Aroroy mining trail to the Eastern Syndicate mine has been completed. On the Colorado-Macatul Point Road things have not been so satisfactory, the road

being only about 75 per cent completed, although the bridge across the Guinobatan River, a wooden Howe truss of 140-foot span, has been finished.

Casiguran has now an artesian well about 520 feet deep, pumping 20 gallons a minute, and another one is being drilled.

Automobile traffic is steadily increasing, the number in Sorsogon being increased by a 60-horsepower Mitchell, while three machines have just started operations on the Bulan-Irocin Road.

The Masbate central school of 5 rooms has been finished and materials are being collected on the site for the Irocin central school, a standard plan No. 7 building.

SURIGAO.

Work on the Placer-Mainit Road has made fair progress in the last quarter. The subgrade has been completed as far as kilometer 12 or to the large barrio of Timauaua, which is a collecting point for a great deal of hemp. Grading is the most expensive item on the construction of this road, since same leads through a virgin forest and tropical jungle; clearing and grubbing generally requires little attention on road projects throughout the Islands, but is, on this project, the most difficult problem. The district engineer acts as foreman on the job and at the same time has to do all dynamiting and shooting of rocks, stumps, etc. Since there is a great scarcity of local labor, carabaos are employed to a large extent in plowing the ground and pulling drag scrapers which has proven very economic.

The contract labor, obtained from the over-populated island of Siquijor, has been returned since the grading is 5 kilometers ahead of the surfacing, for which only a small amount of labor is required and this labor is now secured in the vicinity of Placer and Mainit.

Every year, previous to the setting in of the rainy season, the second-class road from Tandag to Togo has to be extensively repaired. This project is so isolated that the regular caminero system, due to lack of supervision, is not economic or practicable. A gang is now engaged in putting this road in good shape.

The completion of the following school buildings that were started in the last year, but suspended on account of lack of funds, has commenced, carpenters being sent from Manila to work on the following jobs: The barrio schools at Lingig, Gigaquit, Mainit, Carmon, Madrid, and Cantillan. The completion of the barrio school at Cabuntog is held, awaiting the arrival of material that will be voluntarily contributed. School construction is of a difficult nature on this project, since all communication and transportation has to be by water in small craft and is dependent a great deal on the season.

TARLAC.

Very little road construction has been done in this province during the past quarter on account of the heavy rains and the high water in the Tarlac River, which has prevented the delivery of gravel. While the Tarlac River has not been as high by almost a meter this year as is usual during floods, the duration of high water has been much longer.

The construction of three small concrete bridges under contract continues to drag. The contract for this work was signed December 28, 1912. Work was begun in March, 1913. The contract time was up June 1, 1913. To date two are almost completed and pile driving just begun on the third. No extension of time has been granted.

Construction by administration of the Moncada market and tiendas (18 by 42 market and block twenty 4 by 4 tiendas) will be completed about the 10th of October. The lowest bid received for the work was ₱30,000, which, together with surcharges, filling, and inspection, would have brought the cost up to about ₱34,500. The work will be completed by administration for less than ₱20,000, the amount available.

Construction by administration of the Camiling market has just begun; ₱30,000 are available for the project.

The construction of a standard plan No. 2 school building for Sini-lan 2d., Camiling, has been approved; ₱3,362.33 are available. The barrio people will furnish sand, gravel, and logs for sawing the rough lumber, and will do a portion of the transportation of materials.

At this writing prospects are good for a large rice crop in this province. There have been no destructive floods, the locusts have disappeared, and there has been practically no rinderpest. Considerably more land has been planted this year than last. One noticeable effect of the prosperous conditions is the construction of numerous substantial houses throughout the province, many of which are being painted.

TAYABAS.

The business district of Lucena was destroyed by fire on Friday, September 19. It started in the Singer Sewing Machine Company's building at 2.20 p. m., and in three hours ₱1,000,000 damage was the result. All officials—Insular, provincial, and municipal—worked heroically. Too much credit cannot be given to the railroad engineers and their gang of 150 men. The electric-lighting system was badly

crippled. The town is showing a very good spirit and still persists in carrying out the provincial exhibition that was being planned before the fire. It is to be held January 3, 4, 5, and 6 of next year.

A standard plan No. 7 schoolhouse is being constructed by administration in Candelaria.

Authority has been granted to construct by administration standard plan No. 7, Bureau of Education, in the town of Mogpog, island of Marinduque.

The Boac water supply system has been completed with the exception of installing the pumping unit. The pump and boiler are expected from the States early in October. This work has been performed by administration.

Plans are being prepared for the Sariaya water works system. Since the Lucena fire many municipalities are forming plans for installation of waterworks and fire protection.

Lucban school, Bureau of Education plan No. 10, has been completed by administration. The painting on this building was largely performed by volunteer student labor under the supervision of this office. Such coöperation helps out very materially.

Work is being pushed on the Manila-South Road, section Candelaria to Tiaong. Rinderpest developed among the animals, thus causing a delay. Arrangements were made to purchase rock of the Los Baños quarry, but the railroad has failed to supply cars.

On the Manila-South Road through the province guide signs, as per the New York and New Jersey standard, are being installed. They present a very pleasing appearance.



The school boys who painted the Lucban School, Tayabas Province.

Culvert construction under administration continues on the Atimonan-Gumaca section of the Manila-South Road. Total amount expended to date is ₱80,560.95.

ZAMBALES.

A ten-year road and bridge program for Zambales Province has been prepared and submitted for approval of the Director. It involves an Insular loan of ₱100,000 payable by annual installment of ₱10,000 in ten consecutive years, together with the interest of 3 per cent per annum. It includes the construction of 24 reinforced-concrete bridges with a total span of 331 meters, 9 rectangular culverts with a total span of 32 meters, 15 kilometers of first-class road from Subic to San Marcelino, and 2 kilometers from Iba to the beach. The most interesting item in the program is the proposed construction of all the necessary bridges and culverts from Subic to San Narciso during the year 1914, so that by 1915 overland transportation on this section will no longer be an inconvenience to the public. After light repairs to the existing road, operation of auto trucks to carry passengers and freight will become possible, which should be a paying investment to anyone undertaking it, for it would take in the six agricultural towns of San Felipe, San Narciso, San Antonio, San Marcelino, Castillejos, and Subic, the last town being the only safe port in the province during the bad weather period.

Culvert No. 39.36 (3.5 by 1.5) on Subic-North Boundary Road was at last completed in spite of the continuous rains that interfered from the beginning of the construction.

The division superintendent of schools advises that funds will soon be available for the construction of a No. 7 school building in the town of Botolan, and has requested the district engineer to survey the proposed site.

A word regarding the behavior of some of the rivers in Zambales might be of interest in view of the problems involved in bridging them. The following is a history of Santo Tomas River, better known by the name of "San Felipe River" for being at present at the edge of the town by that name:

The origin of this river is up in a mountain, 5,820 feet above sea level, called "Mount Pinatubo," where is also the origin of another river in this province called "Bucao" and that of the "Rio Grande de la Pampanga" on the other side. Up to the year 1859 the San Felipe River was flowing at about kilometer 44 on the Iba-Subic Road. After that year it changed its course to kilometer 39.5 and kilometer 39, alternating between these places till 1873. From that year up to 1883 the river was found between kilometer 38.1 and kilometer 36.5. "Getting tired" of these places it moved farther north to kilometer 32.2, where it is found at present; but not being able to go any farther north on account of mountain barriers extending to the sea, there are indications of underground current at kilometer 35.2 that this "traveling river" intends to go back south. At a point along the river opposite this place it has made a deep turn, and the rate of destruction toward opening a new route is quite rapid. In the recent flood of September 10, 1913, already part of the stream flowed through this place doing considerable damage to the road.

The general tendency of Zambales streams seems to be to move northward. This may be due to the reigning northeast wind which, from the month of June to October, keeps shoving their mouths toward the north.

In some cases the principal cause of the changing of the rivers in this province is the nontechnical methods employed by the farmers in damming the streams for irrigation purposes. This is especially true in the southern part of the province. The soil being rather loose and sandy, such obstruction in the stream will readily cause it to take a new course.

GENERAL ITEMS.

AN OPEN FORUM.

Attention is specially invited to the article in this issue written by Mr. Frank T. James of the contracting firm of Allen & James, the publication of which is a new departure for the BULLETIN. The contractor's view point, it is believed, will be of special interest to all. For this reason the BULLETIN will be glad to receive, and publish, articles from contractors on construction features of public works. It is hoped by this method to arouse greater enthusiasm among all contractors and to unite more closely the officials of the Bureau of Public Works, the contractors, and the public. Consistent with what is believed to be for the best interest of the taxpaying public of the Philippine Islands, it is the desire of the Bureau of Public Works to encourage contractors and to assist them in securing the results in which all are interested.

ANCIENT EMPIRES AND THEIR ROADWAYS.

Thousands of years before the Christian era the empire builders of those days recognized that the prosperity of their countries was dependent on well-built roadways. Mr. L. W. Page, in Roads, Paths, and Bridges, tells of the stone-surfaced roads found in Egypt, built thousands of years ago, of massive stone blocks, in some places 10 feet thick. It was over such a substantial road as this that the stones used in the construction of the great Pyramids were hauled.

Egypt is not the only land possessing relics of early road building. Babylon, the city of hanging gardens and great walls, at a very early date developed a high state of civilization, and Semiramis, its great queen, was an enthusiastic road builder. It is at this period that we find what is probably the first use of stone in bridge building. The two portions of the city were joined by a bridge across the Euphrates. This wonderful bridge was built of large stone blocks, joined with plates of lead.

At that period, more than two thousand years before Christ, asphalt was used instead of mortar in constructing the vast walls around the city. Commerce flourished, and great highways radiated to all the principal cities of the known world. It is said that a highway 400 miles long, paved with brick set in a mortar of asphaltum, connected Nineveh and Babylon.

It was left to the Carthaginians to become instructors to the world in the art of road building. Carthage is given the credit of having demonstrated to the world the strategic and economic value of im-

proved roads. But for a splendid system of highways, which permitted an easy means of communication with all parts of her domains, she never could have reached the heights she attained, either in commerce or war.—The Highway Magazine.

A COMPARISON OF ROADS AND MOTOR TRAVEL.

The following supplies some statistics of value relative to roads and motor travel in France and the United States, which also will serve to correct some misinformation that has found its way into print.

France has 38,000,000 people, 365,000 miles of roads, and 75,000 cars; one car to each 520 people, and one car to a trifle less than every 5 miles of roads. The United States, with 90,000,000 population and 2,200,000 miles of roads has 1,040,000 cars; one for every 87 people, and for a trifle more than every 2 miles of roads. New York State, with 9,000,000 population and 80,000 miles of roads, has more than 106,000 cars, or one to every 85 people and one to every three-quarters of a mile of road in the State.

With reference to the above, the following information for the Philippine Islands is submitted for a comparison:

The Philippine Islands have 8,000,000 people, 4,531 miles of road, and 1,704 automobiles; one car to each 4,694 people, and one car to each 2.6 miles of road.

SCHOOL CONSTRUCTION.

Buildings completed under the supervision of district engineers and accepted by the Director of Education, July 1, 1912, to June 30, 1913.

PLAN NO. 1 BUILDINGS.

Province.	Location (municipality or barrio).	Cost.
Albay	Maslog (Albay)	P2,593.40
Do	do	2,598.75
Do	Lacag (Albay)	2,719.57
Batangas	Balibago (Taal)	2,866.63
Cebu	Consolacion	3,063.84
Ilocos Norte	Pangdan (San Miguel)	2,346.45
Do	Cadarrantan	2,545.42
Do	Golgol	2,359.82
Do	Bingao	2,521.21
Do	Nagpartian	3,443.15
Do	Currimao (Paoay)	2,614.66
Do	San Nicolas	2,705.99
Pangasinan	Balangobong	3,867.69
Misamis	Gusa (Cagayan)	2,921.12
Tarlac	Bilad (Camiling)	1,631.15
Do	Mayantoc	1,643.83
Do	Santa Maria	1,686.24
Do	San Fernando	1,830.55

Leaving out of consideration the 4 Tarlac buildings, where special conditions prevailed, the average cost for the standard 1-room building, plan No. 1, is P2,800, subdivided as follows: Labor, P1,000; material, P1,400; miscellaneous, P145; surcharges, P255.

PLAN NO. 2 BUILDINGS.

Albay	Gapo (Albay)	P4,728.78
Do	Borabod (Albay)	5,290.16
Do	Tanauan (Albay)	4,708.33
Do	Jomapon	5,471.28
Do	Tagoytoy (Albay)	4,723.71
Ambos Camarines	Buhi	4,783.98
Do	Pili	4,960.57
Bohol	Candihay	3,025.89
Do	Cogtong (Candihay)	4,592.15
Do	Batauan (Bohol)	4,531.03
Capiz	Balete	4,869.82
Do	Jimeno	5,221.46
Cebu	Simala (Sibanga)	5,051.42
Ilocos Sur	Ayudante (Candon)	4,479.54
Do	Sevilla (Santa Cruz)	4,997.14
Do	Santa Lucia (Salcedo)	5,188.98
Laguna	Bucal de Cavinti	2,312.68
Pangasinan	Rosales Central	6,637.86
Samar	Santa Margarita (central)	8,627.17
Sorsogon	Guinlajon	3,867.74
Do	San Ramon	4,476.28
Do	San Roque	3,874.20
Do	San Francisco	4,930.67
Surigao	Barcelona (Hinatuan)	5,430.00
Do	Bislig (Hinatuan)	5,430.00
Tarlac	San Clemente	2,776.43
Do	Malualao	4,337.14

Leaving out of consideration the Candihay, Cavinti, San Clemente, and Santa Margarita projects, where special conditions prevailed, the average cost for the standard 2-room building, plan No. 2, is P4,900, subdivided as follows: Labor, P1,450; material, P2,850; miscellaneous, P155; surcharges, P445.

PLAN NO. 3 BUILDINGS.

Province.	Location (municipality or barrio).	Cost.
Ambos Camarines	Baao	P6,408.19
Do	Goa	6,673.08
Bulacan	Batasan	7,566.33
Do	Salacot	6,999.34
Capiz	Panay (New Washington)	6,740.14
Cebu	Liloan central	6,506.17
Ilocos Norte	Solsana	8,515.18
Do	Banna (Batac)	7,680.11
Ilocos Sur	Santo Domingo (central)	7,417.86
Do	Santiago	7,072.25
La Union	Bauang (central)	7,502.86
Do	Caba (central)	7,284.44
Occidental Negros	Silay	12,307.32
Do	Sagay	7,667.46
Pangasinan	Alcala (central)	6,175.21
Rizal	San Pedro Macati	7,700.00
Samar	Bobon (central)	9,433.85
Do	Gandara	9,130.00
Sorsogon	San Jacinto	6,221.72
Tarlac	Capas	6,476.19
Zambales	Castillejos	7,096.04

Leaving out of consideration the Silay project, which was special, the average cost for the standard 3-room buildings, plan No. 3, is P7,310, subdivided as follows: Labor, P2,160; material, P4,300; miscellaneous, P185; surcharges, P665.

PLAN NO. 5 BUILDINGS.

Albay	Legaspi	P8,458.47
Laguna	Los Baños (central)	7,303.83

Plan No. 5 is no longer used.

PLAN NO. 6 BUILDINGS.

Ambos Camarines	Tigaon	P8,267.90
Occidental Negros	San Carlos	13,212.43
Do	Talisay	12,561.94
Pampanga	Santo Tomas (San Luis)	9,271.46
Sorsogon	Bulan	10,716.54
Do	Gubat	13,094.51
Tarlac	Gerona	11,274.84
Rizal	Caloocan	13,347.29

The average cost for the standard 6-room building, plan No. 6, is P11,200, subdivided as follows: Labor, P2,850; material, P7,150; miscellaneous, P200; surcharges, P1,000.

PLAN NO. 7 BUILDINGS.

Albay	Malinao	P21,999.52
Do	Virac	17,606.72
Antique	San José	16,697.06
Leyte	Dulag	17,148.88
Zambales	San Antonio	15,373.96

The average cost for the standard 7-room building, plan No. 7, is P17,765. This cost is excessive, due to conditions for each project being entirely unfavorable, except that of San Antonio. The average cost should approximate P14,500.

PLAN NO. 8 BUILDINGS.

Zambales	Iba Trade School	P11,939.81
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PLAN NO. 10 BUILDINGS.

Albay	Tabaco	P18,636.78
Ambos Camarines	Nueva Caceres	20,003.34
Antique	San Jose High School	21,747.25
Bataan	Balaña (intermediate)	21,863.52
Laguna	Pagsanjan	21,475.63
Do	San Pablo (central)	32,591.75
Occidental Negros	Bacolod (central)	21,471.69
Pampanga	Lubao (central)	18,609.01
Do	Angeles	20,031.87
Samar	Calbayog (central)	21,975.99
Tayabas	Lucena (central)	30,429.64
Do	Boac	23,967.81

Leaving out of consideration the San Pablo and Lucena projects, which were special, the average cost for the standard 9-room building, plan No. 10, is P20,977, subdivided as follows: Labor, P4,800; material, P12,500; miscellaneous, P1,770; surcharges, P1,907.

Reconstruction and special plans.

Province.	Location (municipality or barrio).	Reconstruction or special.	Cost.
Albay	Daraga	Reconstruction	P7,137.66
Do	Albay Trade School	Special	12,098.78
Ambos Camarines	Nabua	do	12,339.21
Do	Paracale	Reconstruction	5,915.28
Antique	Sibalom (central)	do	8,891.91
Do	Antique (San Jose)	do	5,680.90
Batangas	Batangas (central)	Special	6,486.94
Bohol	Tagbilaran Domestic Science School	do	6,961.20
Do	Tagbilaran Trade School	do	2,206.28
Bulacan	Baliuag	do	25,074.02
Cebu	Sibonga	Reconstruction	6,994.75
Ilocos Norte	Laoag (north central)	do	3,759.63
Do	Vintar	do	7,865.18
Iloilo	Miagao (central)	do	5,832.14
Laguna	Majayjay (central)	do	2,924.93
La Union	Tubao (central)	Special	6,130.11
Leyte	Caibiran (central)	Reconstruction	4,590.53
Pangasinan	Manaoag (central)	do	3,202.11

Total number of buildings completed, 112; total cost, P949,028.62.

FISCAL YEAR REPORTS.

An annual report is required of all district engineers immediately upon the close of each fiscal year. These reports cover the larger activities of the district organization. As an example, the following report of Mr. C. G. Morrison, district engineer for Pangasinan Province, is herewith published:

THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
DEPARTMENT OF COMMERCE AND POLICE,
BUREAU OF PUBLIC WORKS.

LINGAYEN, P. I., July 1, 1913.

The DIRECTOR OF PUBLIC WORKS,
Manila, P. I.

SIR: I have the honor to submit the following annual report of the work carried on in the Province of Pangasinan under the direction of the district engineer for the fiscal year ended June 30, 1913.

All relations between the provincial board and this office have at all times been of the best, the individual members of the board often using their personal influence in order to secure results on construction.

The board during the year was composed of the following:

For the first half year, Juan Alvear, governor; Walter E. Jones, treasurer; and Nazario del Castillo, third member.

After January 1, 1913, Aquilino Calvo, governor; Walter E. Jones, treasurer; and Victor Tomelden, third member.

For the fiscal year ending June 30, 1913, there was available from balances on hand, from provincial appropriations, and from special and regular allotments made by the Secretary of Commerce and Police, the total of P639,451.61, of which there had been expended on July 1, 1913, P449,694.71, thus leaving a balance of P189,756.90 to apply on work in the fiscal year 1914. In amount of actual expenditures this compares very favorably with the previous year. As for the year 1912 there was available for expenditure from all sources the total of P662,974.34 of which only P373,596.62 was expended, although a large amount of contractual obligations had been incurred.

Of the 64 projects carried on during the past year, descriptions of the most important ones follow:

PROJECT NO. 3, CONSTRUCTION ROSALES-BINALONAN ROAD.

This road is of standard section, having 5 meters surfacing, 20 centimeters deep of screened river gravel, placed in courses and rolled. On July 1 this road, 19 kilometers in length, was declared first-class with the exception of 2.9 kilometers which had not yet been covered with surfacing. This short stretch will, however, be finished by the end of July, at which time it is the intention of a local corporation to place automobile trucks operating on schedule time on the run from Bautista to Camp One. This project was authorized February 15, 1912, and actual construction was started February 23, 1912. There will have elapsed, therefore, one year and six months at the time of completion of the work.

It appears to the writer that a greater interest in expediting the work might have been shown by the several thousands of people inhabiting the three municipalities traversed. There has at all times been a shortage of both labor and transportation. It is thought that the original small contractors may have been instrumental in estranging the local inhabitants from the work, as a great many cases have been

brought to the attention of the writer where payment had never been made for labor or gravel delivered by them for the contractor. Actions such as these, of course, are sure to have their effect on the work, as uneducated people think that the Government must have a share in these dealings. The fact that the local inhabitants fully appreciated the road as constructed is indicated through the increase of traffic which developed, even during construction.

All the bridges and large culverts on this road were constructed by contract, their sizes and costs being as follows:

Structure.	Contract.	Total cost.
One 80-foot steel truss, No. 27.2	P23,246.88	P27,297.43
One 53-foot steel truss, No. 29.4	10,809.81	12,446.91
Four concrete pile bridges total length, 105 meters	34,712.48	40,861.47
Three culvert, 1 by 1 meters	34,712.48	40,861.47
Six culverts, 1.5 by 1 meters		
One culvert, 2 by 1 meters		
Five culverts, 2 by 1.5 meters		
Two culverts, 3 by 1.5 meters		
Two culverts, 4 by 2.5 meters	34,712.48	40,861.47
Three culverts, 5 by 2 meters		

There were constructed by administration nineteen 60-centimeter pipe culverts at a total cost of ₱1,931.

In addition to the above a 700-foot collapsible deck bridge was constructed across the Agno River at Villasis at a cost of ₱11,153.41, the materials being furnished by the province and the labor was contracted for by the Insular Construction Company. Piling and lumber sufficient for five additional spans are being retained at the bridge site, so that the structure may be repaired or lengthened at any time.

Up to July 1, 1913, there had been expended in the construction of the road project a total of ₱123,492.78, divided as follows:

82,855.55 cubic meters subgrade, rolled, at P0.541	P44,813.62
16,558.435 cubic meters surfacing in place and rolled, at P4.636	76,748.16
Culvert construction	1,931.00
Total	123,492.78

The project was greatly handicapped by a rinderpest quarantine of the neighboring municipalities. From the latter part of October, 1912, to March 20 of this year Urdaneta was under quarantine, and what surfacing was placed was on the 4 kilometers near Binalonan. Then, at the moment when bull carts had begun to come forth in numbers, quarantine was placed on Binalonan, closing the largest gravel pit when the surfacing over 4 kilometers had just nicely started. Urdaneta having been opened up, surfacing was again started there, working from two gravel pits, one of which is located in Asiñgan. This work had no more than started when quarantine was declared on in Asiñgan, thus closing down this pit. On April 1 all quarantine was lifted and for the first time there was uninterrupted entry to all gravel pits and sections of the road. It is estimated that the quarantine in this year alone delayed the completion of the road at least three months, and resulted in a considerable loss to the construction funds.

PROJECT NO. 5, CONSTRUCTION OF TWO STEEL BRIDGES ON LINGAYEN-BALINCAGUIN ROAD.

These bridges, the two having a total span of 280.57 feet, were constructed under contract with the Insular Construction Company for the total sum of ₱35,238.26. Work started in July, 1912, and was completed in March, 1913. The project was at all times seriously handicapped by lack of labor, practically all laborers being imported from Manila. No difficulties were encountered in the work other than the necessity of placing piles under one abutment of bridge No. 36.9. On reaching the proposed base of abutment, a heavy black muck in which were a number of old piles and a mass of vegetation was encountered. Duñgon piles were driven through this mass to a stratum of adobe rock. The total cost of these bridges, including approach fills and all surcharges, was ₱42,911.50.

PROJECT NO. 23, AGUILAR-MANGATAREM ROAD CONSTRUCTION.

There were 10.1 kilometers of this road completed in July, 1912. Since then the remaining 3 kilometers have been surfaced and grade brought to a standard section throughout. Seven 60-centimeter pipe culverts were placed and repairs were made to several old Spanish culverts.

The question of right of way was taken up with the municipal officials, and the required 15 meters was obtained for the entire length of road with absolutely no trouble. This road was declared first-class on July 1. Total cost of 13.1 kilometers, complete, ₱64,089.46.

PROJECT NO. 44, SAN CARLOS PUBLIC MARKET.

This market was constructed under contract with the Insular Construction Company. It consists of a central building 28.4 by

41 meters with an open court, and 10 reinforced-concrete single tiendas with doors of an obsolete type. Contrary to the old style of markets, this structure is well worth a location on the municipal plaza. The total project as originally outlined was finished in May, 1913, and the costs to date are as follows:

Central building (including extras) and 10 tiendas, closed front	P26,613.39
Surcharges	3,341.77
Total	29,955.16

There was remaining on July 1 in this fund ₱6,044.84 with which it is intended to furnish the central building with curtains and sales benches.

PROJECT NO. 48, MAINTENANCE OF FIRST-CLASS ROADS.

One hundred and eight and one-half kilometers of first-class road were maintained under isolated caminero system during the year at an average cost of ₱607.69 per kilometer. Of this entire distance only 22 kilometers are constructed and maintained with crushed rock, the remaining portion being of river gravel. Efforts are being made to have property owners move their fences and houses back 7½ meters from the center line of all roads. This is being done gradually. It is the intention to plant acacia and other approved shade trees along the property lines as soon as these fences are moved. The planting of these trees has already been started on those roads newly declared first class. From July 1 there will be a total of 138.75 kilometers of first-class road under maintenance, an increase of 30.25 kilometers during the year. The total expenditure on first-class road construction was ₱126,160, exclusive of structures.

PROJECT NO. 49, MAINTENANCE OF SECOND-CLASS ROADS.

One hundred and twenty-one and three-tenths kilometers of second-class road were under gang maintenance during the year at an average cost of ₱196.94 per kilometer. This entire distance has been passable to automobiles during the greater part of the year.

PROJECT NO. 50, MAINTENANCE FERRIES AND RIVER CROSSINGS.

All contract ferries are being taken over by the province and substantial "balsas," capable of carrying automobiles, are being substituted for them. Temporary bridges of rough timber and bamboo were maintained on the Agno at Tayug only during the dry season. All wooden bridges between Dagupan and Camp One were strengthened and one rebuilt in order to carry the heavy automobile (10-ton) traffic from Dagupan to Camp One.

In order to facilitate matters and shorten the time of replacing the superstructure of the collapsible bridges, a derrick wagon was constructed in the provincial shops. The first time this was used the deck of the Mangaldan bridge was replaced in two hours, a job which required two days under the old system.

PROJECT NO. 54, REPAIRS TO HERMOSA DIKE.

In the Province of Pangasinan there is one river in particular which is a constant source of dread on account of its custom of running wild over the surrounding country at the least excuse. This stream, the Agno, has its source in the mountains of Benguet and its meanderings cover a large portion of the province before emptying into the Gulf of Lingayen. Yearly the stream has been accustomed to break its banks in several places and seek new and much shorter routes to the sea. One of the more important of these overflow sections was located in the barrio of Hermosa of the municipality of Bayambang. The discharge through this opening was so large and the damages incurred by the property holders in several municipalities so great that the Insular Government constructed a dike to control the stream at this point. This dike, or levee, was constructed in the spring of 1912 from material at the site, which was a light sandy loam. Its top width was 2½ meters and the slopes were 1 on 2, both front and rear, with a height ranging from 2 to 6 meters. Shortly after the completion of the original work during the high water of August, 1912, the central portion of the dike (120 meters in length) failed and the water ran wild through the municipalities of Bayambang, Urbiztondo, Malasiqui, San Carlos, Santa Barbara, Calasiao, and Dagupan. This break flooded 300 square kilometers, destroying crops that were well underway. In the latter part of August this office received a complaint from the municipality of Bayambang, stating that the gap could be closed sufficiently to make it feasible to plant a late rice crop. Taking up the matter with the Bureau it was decided to close the break with sacks filled with dirt. Temporary bamboo framework was started and the sacks were on the ground when another rise in the river scoured the break so that 3½ meters of water was passing through the gap, making it impossible to carry out plans. As planting season was over, this work was abandoned.

This failure occurred in such a way that it was concluded that the original cross section was not of sufficient strength. At the moment when the water was within a meter of the top seepage had started at the bottom, and finally the lower portion being well saturated, the central portion of the dike collapsed and the river broke through. To prevent any future breaks similar in cause, the top width of the whole was increased to 4 meters, the river slope was made 1 on 3, and the rear slope 1 on 12, the new work, of course, to be of the same material as the old. The contract for this work of repair and reinforcement was signed on November 30, 1912, and the work was immediately started. The dike and its vicinity was cleared of all vegetation, especially cogon which was as much as 6 feet in height. All fill was placed in 6-inch layers well puddled. On short hauls up to the time the grade became too steep for men to push, tram cars were used to a great extent. An attempt was made to use a drag scraper of one-half cubic meter capacity for the work in the central portion, the same being operated by a hoisting engine. This scheme for several reasons proved unsuccessful and the hoist was used for operating cars and running a steam pump for puddling the fill. During the month of December labor was very scarce, an average of 30 men only being employed by the contractor. During the following month however labor conditions bettered appreciably and from then on the following methods were used for carrying on the work:

1. 200 men and hoist operating tram cars filling crevasse and back reinforcement.
2. 200 men carrying dirt in baskets for river side reinforcement and filling old borrow pits at toe of slopes.
3. 100 men with wheelbarrows on both rear and front reinforcement.

At the completion of all filling, cogon plants 30 centimeters on centers were placed over the entire river face for protection against rain and wash. Approximately 50 per cent of these plants lived and the dike at present is covered with 6-foot cogon on river side and Bermuda and creeping grasses on top and rear. This contract was finished on February 28, a total of 30,078 cubic meters being placed at a contract unit price of 78 centavos. Later the ends were reinforced and new bamboos were placed in the two old diversion spurs. The method of end protection used is somewhat similar to that used on the Mississippi River and some of the rivers of Japan. Strong male bamboos 4 feet in length were driven 2 feet into the slope of the dike, cogon grass placed between the stakes, and network of galvanized wire, No. 20 gauge, was woven above to hold the grass in position. It is contemplated that this will prevent all scour on the dike ends. The total cost of repairs and reinforcement to July 1 has been ₱27,440.60.

At the present writing the whole dike is covered with a dense growth of cogon grass and has every appearance of being able to withstand a heavy flood season.

PROJECT NO. 55, GENERAL SURVEYS AND INVESTIGATIONS.

During the year there have been 25 kilometers of road surveys completed for which estimates were made. In addition to the above there were surveys made for 4 bridge sites, 11 market sites, and 3 presidencia sites.

During the latter half of the year the new capitol site at Lingayen has been thoroughly surveyed and staked out for grading to start in the month of August.

PROVINCIAL CAPITOL.

Preliminary plans have been drawn for a ₱200,000 office building and a ₱35,000 storehouse and garage. The capitol building is to be of two stories, the first floor being intended for treasury, auditor, and internal revenue and the second floor for the governor and provincial board, the superintendent of schools, district health officer, and the district engineer. The proposed storehouse is a U-shaped building, the front of which is two stories, the upper floor being used for stores. The intentions of the provincial board are to have complete shops and power plant on the first floor.

The grading of the park surrounding the above buildings was started at a recent date. As the extent of the ground covers more than 15 hectares and as it consists of a great many small sand dunes, a Fresno scraper has been designed to be operated by a 22-horse-power hoisting engine. It is expected that earth will be moved at a minimum price with this equipment.

An artesian well has recently been completed which gives a flow of 200 gallons per minute, its depth being 880 feet and the hydraulic head 21 feet 6 inches. It is the intention to handle all this water by electric pumps and a storage plant.

A 50-meter wide boulevard has been staked out between Lingayen Plaza and the site of the new buildings upon which subgrade is to start as soon as a sufficient number of prisoners can be received from Bilibid Prison.

The above-mentioned work on the capitol site, it is contemplated, will be handled by this office by administration, as it is thought that with the amount of equipment on hand we will be able to do the work for less than a contractor. It is the intention, however, to advertise for bids on all building work.

During the fiscal year the following has been the engineering organization in this district: One district engineer, 3 assistant engineers, 1 junior assistant engineer, 1 superintendent of building construction, 1 district clerk, 3 office clerks, 2 surveymen.

From July 1, 1912, up to March 1, 1913, there were employed in the district eight American foremen. On March 1, however, there were remaining out of the above number only two men, one being in charge of the first-class maintenance and the other in charge of the provincial quarry.

On January 1 of this year there were a few good Filipino capataces who were capable of handling work under close supervision.

Special efforts since then have been made to increase this number by several methods. In part these men are graduates of the provincial trade school, the high school, the University of the Philippines, and those who are promoted from the ranks. The aid of the division superintendent of schools has recently been enlisted in securing new candidates for these positions.

There are at least seven Filipinos who have shown themselves fair to be classified as foremen up to the present date. All speak English well and have in the majority of cases a good education. In addition to these men there have been promoted recently two others who speak no English, but who have an excellent command of Spanish. These men have both served their apprenticeship as carpenters. Both are proving of great value, and the results accomplished with them have proved to be much cheaper than in the use of former high-priced supervision. It is the opinion of the writer that any sized construction project in the province can be handled with these men, under the ordinary engineering supervision of an efficient, sympathetic, and painstaking engineer.

During the past summer vacation we have taken several students from Trade School classes and have thus found several other men of excellent caliber who are at present anxious to continue in training for better positions with us. If our present progress in the education of these men continues we will soon be able to furnish other districts less fortunate with good Filipino foremen and capataces.

The number of reports have been decreased to such an extent during the past six months that it has been possible to reduce the office force by one clerk. The value of the remaining cost data has not, however, been impaired in the least, as the former reports were entirely too bulky and on the majority of projects were never kept in the proper condition, as there were only native clerks to handle them. It is expected that with the new system the work can be watched sufficiently close so that at all times the district engineer will be acquainted with the unit costs.

PUBLIC WORKS EXPENDITURES ON PROVINCIAL WORK FOR THE FISCAL YEAR ENDED JUNE 30, 1913.

Province.	Roads, bridges, and ferries.	Buildings.	Miscellaneous.	Total.
Albay	₱129,397.62	₱57,842.48	₱1,602.09	₱188,842.19
Ambos Camarines	122,255.28	18,059.43	323.61	140,638.32
Antique	63,246.84	764.54		64,011.38
Bataan	16,619.76	11,655.18	4,622.61	32,826.55
Batangas	243,297.08	51,883.07	5,129.14	300,309.29
Bohol	133,210.41	5,622.46	2,033.07	140,865.94
Bulacan	302,788.40	78,935.15	7,273.18	388,996.73
Cagayan	87,422.37	19,313.25		106,735.62
Capiz	120,574.39	38,435.58	1,086.18	160,096.15
Cavite	192,587.73	63,866.42		256,454.15
Cebu	435,064.11	90,901.95	80,890.33	606,856.39
Ilocos Norte	87,099.18	42,577.02		129,676.20
Ilocos Sur	167,076.64	21,779.65	666.58	189,522.87
Iloilo	257,373.45	65,451.28	467.94	323,292.67
Isabela	50,830.20	9,804.90	308.76	60,943.86
La Laguna	238,348.47	52,703.68	1,662.93	292,715.08
La Union	92,350.73	23,580.21	1,662.71	117,593.65
Leyte	256,141.86	45,566.85	13,368.48	315,077.19
Misamis	66,140.16	4,779.26	32.29	70,951.71
Nueva Ecija	185,862.68	83,871.00	2,063.55	271,797.23
Negros Occidental	202,228.48	52,422.06	520.60	255,171.14
Negros Oriental	120,415.91	8,445.04	5,574.08	134,435.03
Pampanga	112,293.90	25,333.94	11,942.55	150,170.39
Pangasinan	328,120.49	66,418.52	26,726.22	421,265.23
Rizal	221,890.59	35,274.95	241.65	257,407.19
Samar	96,835.22	20,304.43		117,139.65
Sorsogon	117,629.01	6,229.39		123,858.40
Surigao	48,627.38	2,518.75		51,146.13
Tarlac	85,496.94	58,293.16	4,314.03	148,104.13
Tayabas	248,214.62	73,701.47	1,484.23	323,400.32
Zambales	17,988.06	21,027.50	645.65	39,661.21
Grand total	4,847,427.96	1,157,972.57	174,602.46	6,180,002.99

FINANCIAL.

Appropriations and Allotments for the Insular Fiscal Year Beginning July 1, 1913.

From the funds appropriated by Act No. 2264, there has been released and allotted a total of ₱500,000, distributed as under:

REGULAR ALLOTMENTS.

Province.	Amount.	Province.	Amount.
Albay	₱8,898.75	Leyte	₱14,405.00
Ambos Camrines	8,872.50	Mindoro	1,513.50
Antique	4,958.25	Misamis	4,906.00
Bataan	1,722.25	Negros Occidental	11,430.00
Batangas	9,551.25	Negros Oriental	7,463.50
Batanes	313.25	Nueva Ecija	4,958.25
Bohol	9,968.75	Palawan	1,304.75
Bulacan	8,298.75	Pampanga	8,298.50
Cagayan	4,984.25	Pangasinan	16,388.50
Capiz	10,464.50	Rizal	5,584.50
Cavite	4,984.25	Samar	9,864.25
Cebu	24,217.50	Sorsogon	6,080.25
Ilocos Norte	6,628.25	Surigao	2,975.00
Ilocos Sur	8,533.50	Tarlac	5,036.50
Iloilo	15,214.00	Tayabas	7,568.00
Isabela	2,557.25	Zambales	2,218.00
Laguna	5,219.25		
La Union	4,619.00	Total	250,000.00

SPECIAL ALLOTMENTS.

Laguna: For the construction of the Calamba-Canlubang Road	₱8,000.00
Tayabas: For the construction of the Sariaya-Tiaong Road	20,000.00
Batangas: For first-class road construction	40,000.00
Ilocos Sur:	
For the construction of the Tagudin-Diversion Road	5,000.00
For the construction of the Vigan-South Road	20,000.00
Ilocos Norte: For the construction of the Laoag bridge	25,000.00
Isabela: For the Construction of the Rugao bridge	10,000.00
Oriental Negros: For the construction of the Ocay bridge	20,000.00
Rizal:	
For maintenance of the Manila-North Road	4,000.00
For maintenance of the Pasay-Fort McKinley Road	1,000.00
For maintenance of the Manila-South Road	13,000.00
Pangasinan: For maintenance of the Bobonan-Camp One Road	5,000.00
La Union: For maintenance of the Bangar-Tagudin Road	4,000.00
Bureau of Public Works:	
For road and caminero prizes, to be distributed on recommendation of the road committee	35,000.00
For the necessary expenses of the road committee, fiscal year 1914	10,000.00
For experimental road work	30,000.00
Total	250,000.00

Loans for roads, bridges, schools, municipal and provincial buildings, etc., from June 27, 1913, to September 27, 1913.

Province and project.	Act Nos.—						Total.
	1323.	1728.	1729.	1749.	2059.	2083.	
Albay: Legaspi and Daraga markets	₱20,000	₱8,000		₱12,000			₱40,000
Ambos Camarines:							
Nueva Caceres market	12,500			12,500			25,000
Bato market	6,500	2,600		3,900			13,000
Iriga market	10,000	4,000		6,000			20,000
Balos bridge		3,000		4,500			7,500
Batangas: Balayan Intermediate school		1,000		1,500			2,500
Bohol:							
Tubigon market	6,000	2,400		3,600			12,000
Loboc market			₱4,750				4,750
Baybay market			10,000				10,000
Cebu:							
Argao market	10,000	4,000		6,000			20,000
Argao school	6,125			6,125			12,250
La Union:							
San Fernando market	15,000	6,000		9,000			30,000
Naguilian market		3,200		4,800			8,000
Leyte: Kawayan central school				3,000			3,000
Pangasinan:							
Binalonan market	10,000			10,000			20,000
Lingayen market				11,000		₱11,000	22,000
Rizal:							
Cardona-Pililla, Mariquina-San Juan, and Manila-Navotas Roads						35,000	35,000
For the purpose of purchasing land for public park and erecting kiosks or tiendas, Antipolo				11,500			11,500
Improvements, sanitation and public works, Antipolo					₱20,000		20,000
Tarlac:							
Tarlac-Gerona Road				20,000			20,000
Camiling market				30,000			30,000
Tayabas:							
Lucena market (addition)	15,000			15,000			30,000
Lucban market	9,000			9,000			18,000
Total	120,125	34,200	14,750	179,425	20,000	46,000	414,500

The loans stated in the foregoing table are repayable as follows:

ALBAY.

I hereby certify that the Municipal Board of the city of Manila on August 26, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila:

"Whereas, the municipality of Albay, Province of Albay, P. I., by resolution of the municipal council, No. 190, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱20,000 for the purpose of acquiring market sites in the barrios of Legaspi and Daraga and erecting modern market buildings subject to certain conditions set forth in said resolution to which said municipality of Albay has bound itself;

"And whereas, the Province of Albay, by resolution dated the 8th day of July, 1913, has approved of said Resolution No. 190, series of 1913, of said municipality of Albay, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board, dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board, dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 190, series of 1913, of said municipality of Albay, and said letters of the Governor-General, dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱20,000 is hereby granted the municipality of Albay payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Albay, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First		₱800.00
Second		800.00
Third		800.00
Fourth		800.00
Fifth		800.00
Sixth	₱4,000.00	800.00
Seventh	4,000.00	640.00
Eighth	4,000.00	480.00
Ninth	4,000.00	320.00
Tenth	4,000.00	160.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of acquiring market sites in the barrios of Legaspi and Daraga and erecting modern market buildings, a loan of ₱20,000 is hereby granted the municipality of Albay, Province of Albay, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Albay, who should be advised accordingly. Eight thousand pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱12,000 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First	₱4,000.00	₱320.00		₱480.00
Second	4,000.00	160.00		480.00
Third			₱4,000.00	480.00
Fourth			4,000.00	320.00
Fifth			4,000.00	160.00

AMBOS CAMARINES.

I hereby certify that the Municipal Board of the city of Manila on September 6, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila.

"Whereas, the municipality of Nueva Caceres, Province of Ambos Camarines, P. I., by resolution of the municipal council, No. 110, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱12,500 for the purpose of acquiring a market site and erecting modern market building subject to certain conditions set forth in said resolution to which said municipality of Nueva Caceres has bound itself;

"And whereas, the Province of Ambos Camarines, by resolution dated the 1st day of August, 1913, has approved of said Resolution No. 110, series of 1913, of said municipality of Nueva Caceres, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippines Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolution dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 110, series of 1913, of said municipality of Nueva Caceres and said letters of the Governor-General dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱12,500 is hereby granted the municipality of Nueva Caceres, payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First.....		₱500.00
Second.....		500.00
Third.....		500.00
Fourth.....		500.00
Fifth.....		500.00
Sixth.....	₱2,500.00	500.00
Seventh.....	2,500.00	400.00
Eighth.....	2,500.00	300.00
Ninth.....	2,500.00	200.00
Tenth.....	2,500.00	100.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of acquiring a market site and erecting modern market buildings a loan of ₱12,500 is hereby granted the municipality of Nueva Caceres, Province of Ambos Camarines, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First.....	₱2,500.00	₱500.00
Second.....	2,500.00	400.00
Third.....	2,500.00	300.00
Fourth.....	2,500.00	200.00
Fifth.....	2,500.00	100.00

I hereby certify that the Municipal Board of the city of Manila on August 6, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila.

"Whereas, the municipality of Bato, Province of Ambos Camarines, P. I., by resolution of the municipal council, No. 69, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱6,500 for the purpose of acquiring a market site and erecting modern market buildings, subject to certain conditions set forth in said resolution to which said municipality of Bato has bound itself;

"And whereas, the Province of Ambos Camarines, by resolution dated the 23d day of July, 1913, has approved of said Resolution No. 69, series of 1913, of said municipality of Bato, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved; that, upon the consideration hereinabove set forth and subject to the conditions contained in said Resolution No. 69, series of 1913, of said municipality of Bato and said letters of the Governor-General dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱6,500 is hereby granted the municipality of Bato payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First.....		₱260.00
Second.....		260.00
Third.....		260.00
Fourth.....		260.00
Fifth.....		260.00
Sixth.....	₱1,300.00	260.00
Seventh.....	1,300.00	208.00
Eighth.....	1,300.00	156.00
Ninth.....	1,300.00	104.00
Tenth.....	1,300.00	52.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of acquiring a market site and erecting modern market buildings, a loan of ₱6,500 is hereby granted the municipality of Bato, Province of Ambos Camarines, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. Two thousand six hundred pesos of this loan will be made from insurance fund created by Act No. 1728, and ₱3,900 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First.....	₱1,300.00	₱104.00		₱156.00
Second.....	1,300.00	52.00		156.00
Third.....			₱1,300.00	156.00
Fourth.....			1,300.00	104.00
Fifth.....			1,300.00	52.00

I hereby certify that the Municipal Board of the city of Manila on August 4, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila:

"Whereas, the municipality of Iriga, Province of Ambos Camarines, P. I., by resolution of the municipal council, No. 87, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱10,000 for the purpose of acquiring a market

site and erecting modern market buildings subject to certain conditions set forth in said resolution to which said municipality of Iriga has bound itself;

"And whereas, the Province of Ambos Camarines by resolution dated the 23d day of July, 1913, has approved of said Resolution No. 87, series of 1913, of said municipality of Iriga, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

Resolved; That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 87, series of 1913, of said Municipality of Iriga and said letters of the Governor-General dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱10,000 is hereby granted the municipality of Iriga payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First.....		₱400.00
Second.....		400.00
Third.....		400.00
Fourth.....		400.00
Fifth.....		400.00
Sixth.....	₱2,000.00	400.00
Seventh.....	2,000.00	320.00
Eighth.....	2,000.00	240.00
Ninth.....	2,000.00	160.00
Tenth.....	2,000.00	80.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of purchasing a market site and erecting modern market buildings, a loan of ₱10,000 is hereby granted the municipality of Iriga, Province of Ambos Camarines, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. Four thousand pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱6,000 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First.....	₱2,000.00	₱160.00		₱240.00
Second.....	2,000.00	80.00		240.00
Third.....			₱2,000.00	240.00
Fourth.....			2,000.00	160.00
Fifth.....			2,000.00	80.00

"For the purpose of constructing a bridge over the Balos River, a loan of ₱7,500 is hereby granted the municipality of Iriga, Province of Ambos Camarines, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Ambos Camarines, who should be advised accordingly. Three thousand pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱4,500 from the friar lands bonds sinking fund created

by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First.....	₱1,500.00	₱120.00		₱180.00
Second.....	1,500.00	60.00		180.00
Third.....			₱1,500.00	180.00
Fourth.....			1,500.00	120.00
Fifth.....			1,500.00	60.00

BATANGAS.

"For the purpose of erecting an intermediate school building, a loan of ₱2,500 is hereby granted the municipality of Balayan, Province of Batangas, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Batangas, who should be advised accordingly. One thousand pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱1,500 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First.....	₱500.00	₱40.00		₱60.00
Second.....	500.00	20.00		60.00
Third.....			₱500.00	60.00
Fourth.....			500.00	40.00
Fifth.....			500.00	20.00

BOHOL.

I hereby certify that the Municipal Board of the city of Manila on August 26, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila.

"Whereas, the municipality of Tubigon, Province of Bohol, P. I., by resolution of the municipal council, No. 122, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱6,000 for the purpose of purchasing a market site and erecting modern market buildings subject to certain conditions set forth in said resolution to which said municipality of Tubigon has bound itself;

"And whereas, the Province of Bohol by resolution dated the 24th day of July, 1913, has approved of said Resolution No. 122, series of 1913, of said municipality of Tubigon, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 122, series of 1913, of said municipality of Tubigon and said letters of the Governor-General dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱6,000 is hereby granted the municipality of Tubigon payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Bohol who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First.....		P240.00
Second.....		240.00
Third.....		240.00
Fourth.....		240.00
Fifth.....		240.00
Sixth.....	P1,200.00	240.00
Seventh.....	1,200.00	192.00
Eighth.....	1,200.00	144.00
Ninth.....	1,200.00	96.00
Tenth.....	1,200.00	48.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of erecting a modern market a loan of ₱4,750 is hereby granted the municipality of Loboc, Province of Bohol, payable in five equal annual installments due in one, two, three, four, and five years, as follows, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum: First year, ₱500; second year, ₱500; third year, ₱1,250; fourth year, ₱1,250; and fifth year, ₱1,250. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Bohol, who should be advised accordingly. This loan will be made from the public works and permanent improvement bond sinking fund created by Act No. 1729. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1729.	
	Principal.	Interest.
First.....	P500.00	P190.00
Second.....	500.00	170.00
Third.....	1,250.00	150.00
Fourth.....	1,250.00	100.00
Fifth.....	1,250.00	50.00

"For the purpose of acquiring a market site and erecting modern market buildings, a loan of ₱6,000 is hereby granted the municipality of Baybay, Province of Leyte, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Leyte, who should be advised accordingly. This loan will be made from the public works and permanent improvement bonds sinking fund created by Act No. 1729. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1729.	
	Principal.	Interest.
First.....	P2,000.00	P400.00
Second.....	2,000.00	320.00
Third.....	2,000.00	240.00
Fourth.....	2,000.00	160.00
Fifth.....	2,000.00	80.00

"For the purpose of purchasing a market site and erecting modern market buildings, a loan of ₱6,000 is hereby granted the municipality of Tubigon, Province of Bohol, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Bohol, who should be advised accordingly. Two thousand four hundred pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱3,600 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First.....	P1,200.00	P96.00		P144.00
Second.....	1,200.00	48.00		144.00
Third.....			P1,200.00	144.00
Fourth.....			1,200.00	96.00
Fifth.....			1,200.00	48.00

CEBU.

I hereby certify that the Municipal Board of the city of Manila on August 4, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila.

"Whereas, the municipality of Argao, province of Cebu, P. I., by resolution of the municipal council, No. 103, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱10,000 for the purpose of purchasing a market site and erecting market buildings subject to certain conditions set forth in said resolution to which said municipality of Argao has bound itself;

"And whereas, the Province of Cebu by resolution dated the 24th day of July, 1913, has approved of said Resolution No. 103, series of 1913, of said municipality of Argao, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund: Be it therefore,

"Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 103, series of 1913, of said municipality of Argao and said letters of the Governor-General dated March 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱10,000 is hereby granted the Municipality of Argao payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Cebu, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First.....		P400.00
Second.....		400.00
Third.....		400.00
Fourth.....		400.00
Fifth.....		400.00
Sixth.....	P2,000.00	400.00
Seventh.....	2,000.00	320.00
Eighth.....	2,000.00	240.00
Ninth.....	2,000.00	160.00
Tenth.....	2,000.00	80.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of purchasing a market site and erecting market buildings thereon, a loan of ₱10,000 is hereby granted the municipality of Argao, Province of Cebu, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Cebu, who should be advised accordingly. Four thousand pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱6,000 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First.....	P2,000.00	P160.00		P240.00
Second.....	2,000.00	80.00		240.00
Third.....			P2,000.00	240.00
Fourth.....			2,000.00	160.00
Fifth.....			2,000.00	80.00

I hereby certify that the Municipal Board of the city of Manila on August 9, 1913, adopted the following resolution, the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila:

"Whereas, the municipality of Argao, Province of Cebu, P. I., by resolution of the municipal council, No. 114, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱6,125 for the purpose of erecting a primary school building subject to certain conditions set forth in said resolution to which said municipality of Argao has bound itself;

"And whereas, the Province of Cebu, by resolution, dated the 31st day of July, 1913, has approved of said Resolution No. 114, series of 1913, of said municipality of Argao, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from Governor-General to the Municipal Board, dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 114, series of 1913, of said municipality of Argao and said letters of the Governor-General, dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱6,125 is hereby granted the municipality of Argao payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Cebu, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First		₱245.00
Second		245.00
Third		245.00
Fourth		245.00
Fifth		245.00
Sixth	₱1,225.00	245.00
Seventh	1,225.00	196.00
Eighth	1,225.00	147.00
Ninth	1,225.00	98.00
Tenth	1,225.00	49.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of erecting a primary school building a loan of ₱6,125 is hereby granted the municipality of Argao, Province of Cebu, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Cebu, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	₱1,225.00	₱245.00
Second	1,225.00	196.00
Third	1,225.00	147.00
Fourth	1,225.00	98.00
Fifth	1,225.00	49.00

LA UNION.

I hereby certify that the Municipal Board of the city of Manila on August 7, 1913, adopted the following resolution the original of which has been approved by His Excellency, the Governor-General, and the Secretary of Finance and Justice, and is on file with the records of the city of Manila.

"Whereas, the municipality of San Fernando, Province of La Union, P. I., by resolution of the municipal council, No. 194, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱15,000 for the purpose of purchasing a market site and erecting a modern market building subject to certain conditions set forth in said resolution to which said municipality of San Fernando has bound itself;

"And whereas, the Province of La Union by resolution dated the 7th day of July, 1913, has approved of said resolution No. 194, series of 1913, of said municipality of San Fernando, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board, dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved, That upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 194, series of 1913, of said municipality of San Fernando and said letters of the Governor-General, dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱15,000 is hereby granted the municipality of San Fernando payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of La Union, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First		₱600.00
Second		600.00
Third		600.00
Fourth		600.00
Fifth		600.00
Sixth	₱3,000.00	600.00
Seventh	3,000.00	480.00
Eighth	3,000.00	360.00
Ninth	3,000.00	240.00
Tenth	3,000.00	120.00

"By direction of the Municipal Board, city of Manila:

"For the purpose of purchasing a market site and erecting modern market buildings, a loan of ₱15,000 is hereby granted the municipality of San Fernando, La Union, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of La Union, who should be advised accordingly. Six thousand pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱9,000 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First	₱3,000.00	₱240.00		₱360.00
Second	3,000.00	120.00		360.00
Third			₱3,000.00	360.00
Fourth			3,000.00	240.00
Fifth			3,000.00	120.00

"For the purpose of purchasing a market site and erecting modern market buildings, a loan of ₱8,000 is hereby granted the municipality of Naguilian, Province of La Union, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial

treasurer of La Union, who should be advised accordingly. Three thousand two hundred pesos of this loan will be made from the insurance fund created by Act No. 1728, and ₱4,800 from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1728.		Act No. 1749.	
	Principal.	Interest.	Principal.	Interest.
First	₱1,600.00	₱128.00		₱192.00
Second	1,600.00	64.00		192.00
Third			₱1,600.00	192.00
Fourth			1,600.00	128.00
Fifth			1,600.00	64.00

"For the purpose of completing its central school building, a loan of ₱3,000 is hereby granted the municipality of Kawayan, Province of Leyte, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Leyte, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	₱600.00	₱120.00
Second	600.00	96.00
Third	600.00	72.00
Fourth	600.00	48.00
Fifth	600.00	24.00

PANGASINAN.

I hereby certify that the Municipal Board of the city of Manila on July 15, 1913, adopted the following resolution the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila:

"Whereas, the municipality of Binalonan, Province of Pangasinan, P. I., by resolution of the municipal council, No. 77, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱10,000 for the purpose of acquiring a market site and erecting modern market buildings subject to certain conditions set forth in said resolution to which said Municipality of Binalonan has bound itself;

"And whereas, the Province of Pangasinan, by resolution dated the 30th day of June, 1913, has approved of said Resolution No. 77, series of 1913, of said municipality of Binalonan, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 77, series of 1913, of said municipality of Binalonan and said letters of the Governor-General, dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱10,000 is hereby granted the municipality of Binalonan payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Pangasinan, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First		₱400.00
Second		400.00
Third		400.00
Fourth		400.00
Fifth		400.00
Sixth	₱2,000.00	400.00
Seventh	2,000.00	320.00
Eighth	2,000.00	240.00
Ninth	2,000.00	160.00
Tenth	2,000.00	80.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of acquiring a market site and erecting modern market buildings, a loan of ₱10,000 is hereby granted the municipality of Binalonan, Province of Pangasinan, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Pangasinan, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	₱2,000.00	₱400.00
Second	2,000.00	320.00
Third	2,000.00	240.00
Fourth	2,000.00	160.00
Fifth	2,000.00	80.00

"For the purpose of purchasing a market site and erecting a modern market thereon, a loan of ₱22,000 is hereby granted the municipality of Lingayen, Province of Pangasinan, payable in ten equal annual installments due in one, two, three, four, five, six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Pangasinan, who should be advised accordingly. Eleven thousand pesos of this loan will be made from the friar lands bonds sinking fund created by Act No. 1749, and ₱11,000 from the gold-standard fund created by Act No. 2083. The loan from the gold-standard fund will bear interest at the rate of 3 per cent per annum, and the loan from the friar lands bonds sinking fund, created by Act No. 1749, will bear interest at the rate of 4 per cent per annum. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.		Act No. 2083.	
	Principal.	Interest.	Principal.	Interest.
First	₱2,200.00	₱440.00		₱330.00
Second	2,200.00	352.00		330.00
Third	2,200.00	264.00		330.00
Fourth	2,200.00	176.00		330.00
Fifth	2,200.00	88.00		330.00
Sixth			₱2,200.00	330.00
Seventh			2,200.00	364.00
Eighth			2,200.00	198.00
Ninth			2,200.00	132.00
Tenth			2,200.00	66.00

RIZAL.

I have the honor to state that, for the purpose of constructing or reconstructing the Cardona-Pillila, Mariquina-San Juan, and Manila-Navotas Roads, a loan of ₱35,000 is hereby granted the Province of Rizal payable in two equal annual installments due in one and two years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 3 per cent per annum, and to request that the said amount be placed to the credit of the provincial treasurer thereof who should be advised accordingly. This loan will be made from the gold-standard fund created by Act No. 2083.

For the purpose of purchasing land for a public park and erecting kiosks or tiendas thereon, a loan of ₱11,500 is hereby granted the municipality of Antipolo, Province of Rizal, payable in five annual installments due in one, two, three, four, and five years, as follows, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum: First year, ₱2,000; second year, ₱2,000; third year, ₱2,500; fourth year, ₱2,500; and fifth year, ₱2,500. It is requested that the said amount be placed for disbursement

ment to the credit of the provincial treasurer of Rizal, who should be advised, accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	P2,000.00	P460.00
Second	2,000.00	380.00
Third	2,500.00	300.00
Fourth	2,500.00	200.00
Fifth	2,500.00	100.00

For improvements, sanitation, and public works in the municipality of Antipolo, Province of Rizal, in accordance with the provisions of Act No. 2059, of the Philippine Legislature, a loan of ₱20,000 is hereby granted the province of Rizal payable in five equal annual installments due in ten, eleven, twelve, thirteen, and fourteen years, respectively, from the date of the loan, without interest. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Rizal, who should be advised accordingly. This loan will be made from the funds appropriated by Act No. 2059. The annual payments, when collected, will be credited as follows:

Payments.	Principal. (Act No. 2059).	
Tenth year	P4,000.00	
Eleventh year	4,000.00	
Twelfth year	4,000.00	
Thirteenth year	4,000.00	
Fourteenth year	4,000.00	

TARLAC.

For the purpose of completing the construction of the Tarlac-Gerona Road, a loan of ₱20,000 is hereby granted the Province of Tarlac payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Tarlac, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	P4,000.00	P800.00
Second	4,000.00	640.00
Third	4,000.00	480.00
Fourth	4,000.00	320.00
Fifth	4,000.00	160.00

For the purpose of erecting modern market buildings a loan of ₱30,000 is hereby granted the municipality of Camiling, Province of Tarlac, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Tarlac who should be advised accordingly. This loan will be made from the fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	P6,000.00	P1,200.00
Second	6,000.00	960.00
Third	6,000.00	720.00
Fourth	6,000.00	480.00
Fifth	6,000.00	240.00

TAYABAS.

I hereby certify that the Municipal Board of the city of Manila on July 15, 1913, adopted the following resolution the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila:

"Whereas, the municipality of Lucena, Province of Tayabas, P. I., by resolution of the municipal council, No. 93, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱15,000 for the purpose of erecting additional market buildings subject to certain conditions set forth in said resolution to which said municipality of Lucena has bound itself;

"And whereas, the Province of Tayabas, by resolution dated the 9th day of July, 1913, has approved of said Resolution No. 93, series of 1913, of said municipality of Lucena, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letters and confirmed by letter from the Governor-General to the Municipal Board, dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 93, series of 1913, of said municipality of Lucena and said letters of the Governor-General, dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively, hereinabove referred to, a loan of ₱15,000 is hereby granted the municipality of Lucena payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Tayabas, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payment.	Act No. 1323.	
	Principal.	Interest.
First		P600.00
Second		600.00
Third		600.00
Fourth		600.00
Fifth		600.00
Sixth	P3,000.00	600.00
Seventh	3,000.00	480.00
Eighth	3,000.00	360.00
Ninth	3,000.00	240.00
Tenth	3,000.00	120.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of erecting additional market buildings, a loan of ₱15,000 is hereby granted the municipality of Lucena, Province of Tayabas, payable in five equal annual installments due in one, two, three, four, and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Tayabas, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	P3,000.00	P600.00
Second	3,000.00	480.00
Third	3,000.00	360.00
Fourth	3,000.00	240.00
Fifth	3,000.00	120.00

I hereby certify that the Municipal Board of the city of Manila on July 15, 1913, adopted the following resolution the original of which has been approved by His Excellency the Governor-General and the Secretary of Finance and Justice and is on file with the records of the city of Manila.

"Whereas, the municipality of Lukban, Province of Tayabas, P. I., by resolution of the municipal council, No. 147, series of 1913, has, with the approval of the Governor-General, requested of the city of Manila a loan of ₱9,000 for the purpose of erecting a modern market subject to certain conditions set forth in said resolution to which said Municipality of Lukban has bound itself;

"And whereas, the Province of Tayabas, by resolution dated the 9th day of July, 1913, has approved of said Resolution No. 147, series of 1913, of said municipality of Lukban, and has guaranteed the prompt payment of said loan;

"And whereas, the Governor-General of the Philippine Islands, by letters to the Municipal Board dated March 11, 1913, and May 14, 1913, has proposed a plan accepted by the Municipal Board by resolutions dated March 25, 1913, and May 16, 1913, for the making of loans to municipalities from the city of Manila sewer and waterworks bonds sinking fund, and has undertaken certain obligations on the part of the Insular Government in connection therewith, as set forth in said letter and confirmed by letter from the Governor-General to the Municipal Board, dated May 19, 1913;

"And whereas, the Municipal Board, subject to the approval of the Governor-General and the Secretary of Finance and Justice, has authority to invest said city of Manila sewer and waterworks bonds sinking fund; Be it therefore

"Resolved, That, upon the consideration hereinabove set forth, and subject to the conditions contained in said Resolution No. 147, series of 1913, of said municipality of Lukban and said letters of the Governor-General, dated March 11, 1913, May 14, 1913, and May 19, 1913, respectively hereinabove referred to, a loan of ₱9,000 is hereby granted the municipality of Lukban payable in five equal annual installments due in six, seven, eight, nine, and ten years, respectively, from the date of the loan, together with interest, payable quarterly at the rate of 4 per cent per annum. It is requested that on direction of the Executive Secretary, acting for and in behalf of the Municipal Board, the said amount be placed for disbursement to the credit of the provincial treasurer of Tayabas, who should be advised accordingly. This loan will be made from the city of Manila sewer and waterworks bonds sinking fund created by Act No. 1323 of the Philippine Commission. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1323.	
	Principal.	Interest.
First		₱360.00
Second		360.00
Third		360.00
Fourth		360.00
Fifth		360.00
Sixth	₱1,800.00	360.00
Seventh	1,800.00	288.00
Eighth	1,800.00	216.00
Ninth	1,800.00	144.00
Tenth	1,800.00	72.00

"By direction of the Municipal Board, city of Manila.

"For the purpose of erecting a modern market, a loan of ₱9,000 is hereby granted the municipality of Lukban, Province of Tayabas, payable in five equal annual installments due in one, two, three, four,

and five years, respectively, from the date of the loan, together with interest, payable quarterly, at the rate of 4 per cent per annum. It is requested that the said amount be placed for disbursement to the credit of the provincial treasurer of Tayabas, who should be advised accordingly. This loan will be made from the friar lands bonds sinking fund created by Act No. 1749. The annual payments, including interest due, when collected, will be credited as follows:

Payments.	Act No. 1749.	
	Principal.	Interest.
First	₱1,800.00	₱360.00
Second	1,800.00	288.00
Third	1,800.00	216.00
Fourth	1,800.00	142.00
Fifth	1,800.00	72.00

CONVERSATION.

One day through the primeval wood,
A calf walked home as good calves should;
But made a trail all bent askew,
A crooked path as all calves do.
The trail was taken up next day
By a lone dog that passed that way;
And then a wise bellwether sheep
Pursued the trail o'er vale and steep,
And drew the flock behind him, too,
As good bellwethers always do.
And from that day o'er hill and glade,
Through those old woods a path was made;
And many men wound in and out,
And dodged and turned and bent about
And uttered words of righteous wrath
Because 'twas such a crooked path.
But still they followed—do not laugh—
The first migration of that calf,
And through the winding roadways stalked
Because he wobbled when he walked.
So men prefer to go it blind
Along the calf paths of the mind,
And work away from sun to sun
To do what other men have done.

—Sam Walter Foss.

APPENDIX A.

CIRCULAR LETTERS ISSUED BY PROVINCIAL DIVISION FROM JULY 1 TO SEPTEMBER 30, 1913.

MANILA, June 3, 1913.

Provincial Division Circular No. 104.

SIR: I have the honor to invite your attention to the fact that the Purchasing Agent advises that he has in stock seasoned, a part of which has been drying in the air for two years, the following varieties, quantities, and prices of commercial lumber:

Kind.	Board feet.	Selling price per 1,000.
Yacal	2,504,818	P128.67
Montol or pagatpat	513,052	112.53
Guijo	836,382	105.017
Lumbayao	621,827	79.25
Narra (4-inch)	1,725	173.54
Narra	40,631	207.30
Apitong	896,713	71.51
Redwood	701,946	78.85
Ipil	106,191	191.65
Palosapis	1,191	57.75
Mangachapuy	32,822	125.14
Palomaria	91,193	119.46

In addition to the quantity of sawed lumber above set out, the Purchasing Agent advises that he has great quantities of ipil, acle, amuguís, molave, etc., in the log which can be sawed to dimensions at any time. This lumber should be given preference in all your requisitions.

Very respectfully,

WARWICK GREENE,
Director of Public Works.
By E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, June 16, 1913.

Provincial Division Circular No. 105.

SIR: When telegraphic requests are forwarded the Bureau of Public Works for supplies and forms, furnished by the Bureau to the provinces without charge, such telegraphic requests must be immediately followed by requisition made out on Form No. 45-A, duly accomplished and signed with the following notation on the face thereof; "Confirming telegraphic request of _____, _____th, 19____." This will permit the immediate filling of the telegraphic requisition by the Bureau of Public Works, and upon the receipt of Form 45-A, properly referenced to the telegram, the record will be complete. District engineers are personally directed to give this matter attention in every case in which a telegraphic request is sent.

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, June 16, 1913.

Provincial Division Circular No. 106.

SIR: You are directed to submit to this office, within a period of thirty days a statement showing the quality and type of heavy machinery and equipment operating in your district. The list should include motor cars, trucks, traction engines, agricultural machinery, road-building machinery, sugar mills, lumber mills, etc., the list to embody both privately owned and public property.

Information is also desired on the prospect for developing a market for each class of machinery as specified, or of any other class of machinery that it is believed might be used to advantage in developing the resources of the province. For public use, special attention should be given the feasibility of employing a dump motor truck with demountable body in the distribution of surfacing material over first-class roads, using same as a sprinkler during the dry season or to be otherwise employed for transportation purposes on the first-class roads of the province.

In addition to the above data, information is desired on the following:

1. A list of garages owning automobiles and motor trucks for hire.
2. A list of individuals, firms, and corporations, with their addresses, operating automobiles and motor trucks for passengers and freight on regular schedules in any part of the district.

3. The following data in regard to the road system of the district: (a) The present kilometerage of first, second, and third class roads; (b) the approximate proportion of the two latter which can be used by automobiles and motor trucks, and the number of months of the year during which such use is in each case possible; (c) the approximate proportions of level and hilly roads, and any data which you regard as pertinent relative to the grades most frequently to be met with.

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, June 17, 1913.

Provincial Division Circular No. 107.

SIR: Attention is invited to paragraph 5, rule 13, of Executive Order No. 5, series of 1909, issued under date of January 9, 1909, quoted for the information of all concerned.

"No officer or employee shall engage in any private business, vocation, or profession, or be connected with any commercial undertaking, or lend money on real or personal property, without written permission from the chief of the Bureau or Office in which he is serving, and the Governor-General or proper head of Department. As a general rule, in any enterprise which involves the taking of time, this prohibition will be absolute in the case of those officers and employees whose remuneration is fixed on the assumption that their entire time is at the disposal of the Government; if granted permission to engage in a business requiring time of applicant, copies must be furnished the Director."

This provision in Executive Order No. 5, series of 1909, shall be from time to time brought to the attention of all the employees of the district engineer's office, and an absolute compliance with the provisions of the paragraph of the Executive Order mentioned is directed. Any private or personal interest, of any nature whatsoever, outside of the regular duties to which the employee of this Bureau is assigned shall be promptly reported to the Director of Public Works in detail, and authorization for such participation in such personal or private enterprise requested by the person concerned.

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, June 18, 1913.

Provincial Division Circular No. 108.

SIR: You are advised that the Bureau of Lands proposes to make municipal street maps throughout the Islands, and to make a charge of ₱20 for each municipal survey executed, including three blue prints of map, to the province, and ₱20 for the survey and the same number of blue prints to the municipality. After the payment by the province of ₱20 and by the municipality of ₱20, for the survey and six blue prints, a charge of 50 centavos will be made for each additional blue print. The Bureau of Lands advises further that "definite action has not yet been taken in this matter, and until the majority of the provincial officials have agreed to the purchase of these plans, both for the provinces and municipalities, it will be impossible to put this proposed procedure into effect."

It is the opinion of this Bureau that these maps would be of considerable value to you and your office, when filed therein, and that the cost proposed is very reasonable.

Therefore, it is directed that the matter be taken up with the provincial officials and that they be urged to accept the proposition.

For the Director.

CHARLES E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, June 20, 1913.

Provincial Division Circular No. 109.

SIR: You are advised that it is very desirable that provision be made for the obtaining of proper shade trees along the highways. The beginning of the rainy season is the best time to plant these trees.

Therefore, you are directed to plant shade trees at this time along the first-class roads of approved alignment and of approved right of way width.

In the future this work should be given special attention at the beginning of each rainy season. The trees will be set parallel to the approved center line of the road and upon the right of way limits. The rain trees (acacia) shall be set 25 meters apart, and all other species 20 meters. All trees shall be planted so that they shall not be opposite, but that they shall alternate. For example, the trees upon the left side shall be planted at points opposite the middle points between the trees of the right side. Care must be taken to plant the trees in a line, and that they be grown with vertical trunks.

The following trees only will be permitted to be planted: Rain tree (acacia), tamarind (sampaloc, salomague, sambac), pili, palomaria, duñgon late, pagatpat, and api-api. The palomaria and duñgon late shall be planted only upon coastal roads possessing well-drained soil. The pagatpat and api-api shall be planted only along roads bordering on or running through salt-water swamps.

Before planting, all trees shall be well pruned and the freshly cut surfaces painted over with tar or paint. When the planting is in localities exposed to the winds, the trees shall be carefully pruned a short time before the beginning of the rainy season. All trees shall be properly protected. It is especially directed that considerable planting be accomplished at the beginning of the coming rainy season. All trees shall be uniform in size when planted, and about 2 meters in height. Additional information upon the planting and care of trees may be found in QUARTERLY BULLETIN No. 1, Volume 2. This order is a modification of the announcement upon page 5, QUARTERLY BULLETIN No. 3, Volume 1.

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, July 1, 1913.

Provincial Division Circular No. 110.

SIR: It is desired to especially impress all district engineers with the absolute necessity of economy in the administration of the district offices. Each detail entering into the cost of the district office shall be closely scrutinized and every possible effort made to reduce the cost, consistent with efficient operation.

All district engineers are directed to communicate with the provincial board and the municipal councils and request that in the future all communications be sent to the district engineer in triplicate, thereby eliminating the necessity of copying in the district engineer's office when papers received from the provincial board and the municipal council are required to be forwarded to the Manila office. When such papers are received in triplicate, two copies should be forwarded to the Manila office when it is necessary to forward such papers. This will eliminate the necessity of a great amount of additional copying in the Manila office. Communications referred to above as being received from provincial board or municipal councils will include resolutions, etc.

Care is especially directed that all papers and data prepared in the district engineer's office should be carefully scrutinized before forwarding to the Manila office. This is specially applicable to road estimates, profiles, etc., as the postage cost in returning such papers to the district engineers, through lack of proper accomplishment, is very considerable. As many communications as possible will be answered in the Manila office by letter direct. No papers except those absolutely pertinent to the district engineer's files will be returned. Special care is directed in the enforcement of the above regulations and in the inauguration of all other methods possible to reduce the actual cost of the district engineer's office expenses to a minimum.

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, July 7, 1913.

Provincial Division Circular No. 111.

SIR: Your attention is invited to the following extract from a letter of reprimand which was forwarded recently to a certain district engineer. It is not agreeable with the present feelings of those in this Bureau to address letters of reprimand, but when official transgressions are of sufficient seriousness and importance, they will be

issued. It is hoped that a knowledge of the said extract by all the district and assistant engineers of this Bureau may make it unnecessary to issue the like in the future.

"Through your neglect and gross carelessness, you made it possible for these explosives to get into the hands of irresponsible parties, endangering life and property as well as public order. You have also violated Special Order No. 30 of this Bureau. You will consider this as an official reprimand, more drastic action not being taken in view of your past efficient services, covering a period of years."

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, July 7, 1913.

Provincial Division Circular No. 112.

SIR: Your attention is invited to the inclosed copy of Provincial Circular No. 17 of the Executive Bureau, giving instructions relative to the manner of making out requisitions upon the Bureau of Supply. You will conform strictly to the instructions and directions contained in this circular in submitting provincial requisitions.

For the Director.

C. E. GORDON,
Acting Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

"THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
EXECUTIVE BUREAU.

"Provincial Circular No. 17.

"Subject: Requisitions, Bureau of Supply, Manner of making.

BAGUIO, March 31, 1913.

"REQUISITION FORMS.

"1. Requisitions for supplies for the provinces will be made on Bureau of Supply Form No. 2, and must be completed in every respect, the certificates at the bottom thereof being signed by the proper officials.

"2. Requisitions for supplies for the municipalities will be made on Bureau of Supply Form No. 2-a, and, after signature by the proper municipal officials, will be forwarded through the provincial treasurer for his approval.

"3. "Rush" requisitions must be made on the special form provided therefor—Bureau of Supply Form No. 1—B. (See paragraphs 10 and 11.)

"REQUISITIONS—MANNER OF FILLING OUT.

"4. If one sheet of the regular requisition form is not sufficient for the enumeration of the items desired, additional sheets of the same form should be utilized, with the certificate at the bottom removed. Allow at least one full printed line for each item.

"5. Care should be taken to fill out requisition forms properly. All blank spaces should be lined out with red ink, and the title of the official whose signature is necessary, if not printed on the form, should be typed in so that the requisition will be ready for signature without further preparation.

"6. All requisitions, both telegraphic and mail, must be sent through the Executive Secretary.

"7. All requisitions should clearly state the quality, number, sizes, dimensions, quantity, weight, etc., as the case may require, of the articles desired. (See paragraph 14.)

"8. Provincial treasurers should carefully inspect each municipal requisition forwarded through them and, when unnecessary or unusually expensive articles or excessive quantities are requested, should take up the matter with the municipal authorities with a view to having same changed.

"9. The certificate at the bottom of all requisitions must be signed by the provincial treasurer. When supplies or materials ordered are for the repair or construction of schoolhouses or other special projects and are payable from special funds, the certificate at the bottom of the form should be changed, striking out the words 'and that an appropriation has been made by resolution No.—, series of—, of the provincial board,' and inserting in lieu thereof the words 'and that an allotment (appropriation, etc.) has been made for the construction (reconstruction, repair, etc.) of the _____ (giving name of project.)'

"10. Every requisition should contain specific shipping directions.

SEPARATE REQUISITIONS.

"11. Separate requisitions will be made in every case and without exception for—

"(a) Supplies or material for work under the control of the district engineer, regardless of the fund from which payable. These requisitions should be prepared in triplicate by the district engineer

approved on their face, and forwarded by him through the provincial treasurer who will sign the certificate and retain one copy for his records.

"(b) Supplies or material used in the repair and construction of roads and bridges, public buildings, or other public works not under the control of the district engineer.

"(c) Supplies or material payable from provincial or municipal school funds, which would be approved on their face by the division superintendent of schools or his duly authorized representative.

"(d) Supplies or material for the repair or construction of school-houses or other special projects under the direct charge of a special representative of the Bureau of Education or Public Works, the funds which are being disbursed by the provincial treasurer, should be made out in triplicate, approved on their face by said representative, and forwarded to the provincial treasurer who will sign the certificate. Such requisitions will clearly state the project and funds from which payable.

"(e) Large cattle, which should be made on the regular Bureau of Supply form, striking out the words 'The Purchasing Agent' and 'Bureau of Supply' and inserting the words 'Bureau of Agriculture.'

"(f) Ready-made clothing for prisoners and other supplies furnished by the Bureau of Prisons for which will be used the regular Bureau of Supply form, striking out the words 'The Purchasing Agent' and 'Bureau of Supply' and inserting the words 'Bureau of Prisons.'

"(g) Water craft or equipment, or other supplies furnished by the Bureau of Navigation, for which will be used the regular Bureau of Supply form, striking out the words 'The Purchasing Agent' and 'Bureau of Supply' and inserting the words 'Bureau of Navigation.'

"(h) Firearms or ammunition, sabers, and other weapons for the use of the municipal police, which should be forwarded to this office through the senior inspector and Director of Constabulary.

"(i) Medicines and disinfectants mentioned in paragraph 23, for which will be used the regular Bureau of Supply form, striking out the words 'The Purchasing Agent' and 'Bureau of Supply' and inserting the words 'Bureau of Health.'

"(j) Medicines and disinfectants furnished by the Bureau of Supply.

"(k) Telephones and telephone supplies.

"Requisitions mentioned in (a) and (b) will be forwarded by this Office to the Bureau of Supply, through the Director of Public Works, for his information.

"Requisitions mentioned in (c) will be forwarded by this Office to the Bureau of Supply, through the Director of Education, for his information.

"Requisitions mentioned in (d) will be forwarded by this Office to the Bureau of Supply, through the Director of Education, or the Director of Public Works, as the case may require, for their information.

"Requisitions mentioned in (e), (f), (g), (h), and (i) will be forwarded by this Office direct to the bureaus upon which they are drawn.

"Requisitions mentioned in (j) and (k) will be forwarded by this Office to the Bureau of Supply, through the Directors of Health and Posts, respectively, for their approval. The Governor-General has authorized the Director of Health to make such changes in requisitions for medicines and disinfectants as may to him seem wise.

"TELEGRAPHIC 'RUSH' REQUISITIONS.

"12. In all cases where a telegraphic requisition is made, it will be sent direct to this office and be followed immediately by a requisition on the regular form, properly accomplished, to which will be attached a copy of the telegraphic requisition, and notation will be made to the effect that the requisition is in confirmation of telegraphic requisition attached.

"13. Under no circumstances should a 'rush' requisition be made without substantial reason therefor, as rush orders cannot be as economically handled as those which take the ordinary course. (See paragraph 3.)

"RESOLUTIONS.

"14. It is unnecessary to have two meetings of the municipal council, one to authorize a certain work and another to authorize the purchase of material. The council can at the same time authorize the project and the purchase of the necessary material.

"15. A copy of the resolution of the provincial board or municipal council, as the case may be, need not be attached to a requisition, as this office will hold that the provincial treasurer's certificate at the bottom of the forms will meet all requirements, if properly accomplished.

"WEIGHTS AND MEASURES.

"16. With reference to weights and measures, the provisions of Act No. 1519, as amended by Act No. 1843, and Executive Order No. 77, series of 1908, govern. Except with reference to manufactured lumber, which may be bought and sold by English measure (inches and feet), the metric system will be used in expressing the lengths, quantities, or weights of articles requisitioned for: *Provided*, That the use of the metric system shall be optional in stating sizes, descriptions, or specifications of articles manufactured in foreign countries. For instance, it is proper to order 1,000 kilos (or meters) of 2-inch rope; 10 kilos of 5-inch (40d.) nails; 100 lineal meters of 2-inch pipe; 1 36-inch carriage typewriter, if these articles are of foreign manufacture.

"ARMS AND AMMUNITION.

"17. Under no condition will either arms or ammunition be furnished by a province to a municipality unless the provincial requisition distinctly states that they are purchased for that purpose, or unless specific authority is granted by this office. (See paragraph 11 (h).)

"ENVELOPES, ETC.

"18. Plain envelopes, stock memorandum books, etc., are not furnished by the Bureau of Printing, but by the Bureau of Supply.

"MANUFACTURES OF BUREAU OF PRISONS.

"19. Articles manufactured by the Bureau of Prisons, such as wagons, furniture, prisoners, uniforms, etc., may be secured without the intervention of the Purchasing Agent, and requisitions therefor should be forwarded to the Bureau of Prisons, through this Office, in a like manner as those on the Bureau of Supply. (See paragraph 11 (f).)

"20. Ready-made prison uniforms (*carcel*, detention, and liberty and *salacots* (hats) may be secured by requisition from the Bureau of Prisons. The complete uniform consisting of blouse and pants, ₱1.70, and the *salacots* are ₱1 each. Uniforms may be had in the sizes and measurements indicated below. The pants are closed front fastened with a draw string and consequently each size is adjustable within the waist sizes given (see paragraph 11 (f)):

"Sizes and measurements of uniforms.

[In centimeters.]

Sizes.	Pants.		Blouse.	
	Waist.	Length.	Waist.	Length.
1	58 to 68	104	84	66
2	66 to 76	110	86	70
3	74 to 80	112	88	74

"OREGON PINE.

"21. The use of Oregon pine for any purpose other than for forms for concrete work above ground, and other temporary purposes, has been prohibited by the Governor-General, and this Office will eliminate any item for Oregon pine appearing on a provincial or municipal requisition, unless the purpose for which it is to be used is clearly stated.

"WATER CRAFT.

"22. Permission will not be given for the purchase of water craft or floating equipment of any kind until the advisability of such purchase can be clearly shown. Such requests when received will be forwarded to the Bureau of Navigation for report and recommendation. (See paragraph 11 (g).)

"SIMPLE REMEDIES PACKAGES.

"23. In order to meet the needs of the smaller and more isolated municipalities and for the use of work parties in the field, the Director of Health has prepared three sizes of 'simple remedies packages' which may be obtained upon requisition on the Bureau of Health. (See paragraph 11 (i).)

"Each package is accompanied by a small pamphlet in English, Spanish, and the principal dialects clearly explaining the use of these simple remedies.

"These packages are as follows:

"SIMPLE REMEDIES PACKAGE NO. 1, PRICE ₱25.

No.	Article.	Unit.	Amount.
	Absorbent cotton	Grams	500
	Adhesive plaster, 5 meters, 1.27 centimeter	Spool	1
	Bandages, cotton, 7.62 centimeter		12
	Bandages, gauze, 2.54 and 5.08 centimeter		24
	Medicine droppers		2
1	Boric-acid powder, in bottle	Grams	100
2	Calomel tablets, 1-grain		100
3	Camphorated oil	Cubic centimeters	250
4	Carbolated vaseline	Grams	250
5	Castor oil	Cubic centimeters	500
6	Compound cathartic pills		100
7	Cough tablets		100
8	Diarrhea and dysentery tablets		100
9	Epsom salts	Kilos	2
10	Headache tablets, 5 grain		100
11	Iron, quinine, and strychnine tablets		100
12	Liquid cresolis compound (lysol)	Cubic centimeters	500
13	Quinine tablets, 3-grain		1,000
14	Rhinitis tablets		100
15	Soda bicarbonate	Grams	250
16	Spirit of peppermint	Cubic centimeters	100
17	Sweet spirit of niter	do	100
18	Tincture benzoin compound (Friar's balsam)	do	100
19	Tincture of iodine (G. S.)	do	30
20	Toothache drops	Bottle	1

"SIMPLE REMEDIES PACKAGE NO. 2, PRICE ₱8.

	Absorbent cotton	Grams	250
	Adhesive plaster, 5 meter, 1.27 centimeter	Spool	1
	Bandages, assorted, 5.08 and 6.72 centimeter		12
	Medicine dropper		1
1	Boric-acid powder	Grams	50
2	Calomel tablets, 1-grain		50
3	Camphorated oil	Cubic centimeters	100
4	Carbolated vaseline	Grams	100
5	Compound cathartic pills		50
6	Cough tablets		50
7	Diarrhea and dysentery tablets		50
8	Epsom salts	Grams	500
9	Headache tablets, 5-grain		50
10	Iron, quinine, and strychnine tablets		50
11	Liquid cresolis compound (lysol)	Cubic centimeters	250
12	Quinine tablets, 3-grain		200
13	Rhinitis tablets		50
14	Soda bicarbonate	Grams	150
15	Spirit of peppermint	Cubic centimeters	60
20	Toothache drops	Bottle	1

"SIMPLE REMEDIES PACKAGE NO. 3 PRICE ₱2.

	Adhesive plaster	Piece	1
	Bandage, 5.08 centimeter wide		1
1	Boric-acid powder	Grams	25
6	Compound cathartic pills (in bottle)		25
8	Diarrhea and dysentery tablets		25
10	Headache tablets, 5-grain		25
13	Quinine tablets, 3-grain		25
14	Rhinitis tablets		25
15	Soda bicarbonate	Grams	25

"He has also prepared an emergency disinfecting package costing ₱10.00 and containing—

"4 liters kreso.

"2 kilos potassium permanganate.

"1 disinfecting pump.

"The same package with two pumps will be furnished for ₱16.

"OPEN MARKET PURCHASES.

"24. Under the provisions of Act No. 164, as amended by Act No. 231, the Governor-General is empowered to authorize purchase in the open market without the intervention of the Purchasing Agent. Provincial treasurers will be held to a strict accountability for any and all purchases so made, and subsequent authority will not be given except where it can be conclusively shown that the interest of the service would have suffered had purchases been made in the regular way.

"25. Section 12 of Act No. 146, as amended by Act No. 231, reads as follows:

"Nothing in this Act shall hereafter be construed to require that purchase of material, supplies, and other things needed for the use of any provincial government shall be made through the Purchasing Agent, if such articles are in the province and can be purchased by the provincial treasurer at prices deemed by the provincial board to be reasonable."

"Purchases under this section will be limited absolutely and strictly to products of and articles manufactured in the province, and such material, supplies, or articles as are actually carried *in stock* by bona fide merchants, subject to the conditions of paragraph 26 hereof. Permission will always be granted, upon request, for those purchases if necessity demands.

"26. Such purchases as may be legally made by provinces or municipalities without the intervention of the Bureau of Supply must be at prices not in excess of Bureau of Supply prices for like quality, and the Insular Auditor will promptly suspend and refer to this Office all deviations from this rule.

"ANNUAL ESTIMATES.

"27. Attention is drawn to section 2049 of the Compilation of the Acts of the Philippine Commission, quoted in Provincial Circular No. 16, with reference to the submission of annual estimates to the Bureau of Supply, and to Executive Order No. 1 (series 1909) upon the same subject.

"These estimates will be prepared and forwarded during the month of June of each year.

"For The Executive Secretary.

(Sgd.) "W. A. RANDALL,
"Acting Special Agent.

"To all PROVINCIAL TREASURERS."

MANILA, July 11, 1913.

Provincial Division Circular No. 113.

SIR: Your attention is invited to Bureau of Education Bulletin No. 38, School Buildings, forwarded herewith under separate cover for your information and use. This bulletin contains plans, specifications, and bills of material for standard revised school, buildings of the Bureau of Education. You are directed to place this bulletin in the permanent files of your office, and acknowledge receipt of same.

For the Director.

E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, July 15, 1913.

Provincial Division Circular No. 114.

SIR: Your attention is invited to the following information, as received from the Purchasing Agent:

"OFFICE OF THE BUREAU OF SUPPLY,
"Manila, P. I., July 3, 1913.

"We have, through the Institute of Industrial Research Washington, D. C., had manufactured a new metal rust inhibitive paint, a sublimed blue lead primer for the first coat and a red color of bright oxide of iron, red lead, and zinc chromate for the top coating, also a green. These paints are designed for metal work only. The primer, is known as *De Co. Rust Inhibitive Primer*.

"The colors for top coats: *De Co. metal top coating (red)*; *De Co. metal top coating (green)*.

"Prices, rust inhibitive primer:

1-gallon tins	₱3.74
5-gallon tins	18.71

"Prices, top coating:

Red, 1-gallon tins	2.95
Green, 1-gallon tins	3.51

This paint may be used upon metal galvanized roofs, which have been exposed to the weather for some time. The rust inhibitive primer may therefore be applied directly to the metal followed by a second coater after proper drying. Whenever new galvanized metal is to be painted there should be first applied to the metal a wash composed of 6 ounces of copper acetate or copper chloride dissolved in 1 gallon of water. This wash prepares the smooth spangled surface to receive the primer without danger of blistering. *All Apollo iron roofs should be painted.* By November 1 we will introduce a new roofing which, if properly taken care of before it is put on the roof, will not require painting. This will be an iron 99.84 pure, with 2½ ounces of spelter to each square foot of galvanizing coating.

"E. G. SHIELDS, Purchasing Agent."

In connection herewith you are advised that where a "Eureka" or "R. I. W." point has been used, the De Co. metal top coating, as herein described, may be used, if red or green color effect is desired.

In all cases where galvanized-iron roofs are painted, the kind of paint used and the date of application should be made of record in your office. It may also appear advantageous to have this information painted underneath the roof in some inconspicuous place as a further record. Example: "Eureka 7/25/13," "De Co. 7/30/13." In this manner data may be secured which will later be of material value for comparison of materials.

For the Director.

E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, August 2, 1913.

Provincial Division Circular No. 115.

SIR: Your special attention is invited to the following communication, and a strict and careful compliance therewith directed:

"JULY 31, 1913.

"SIR: With reference to the neglect of road rollers and other machinery intrusted to the district engineers which, at times in the past, has occurred, and which has been the subject of several communications from me, you are hereby informed that I intend to hold the district engineers strictly responsible for the proper operation and maintenance of all road rollers and other machinery intrusted to their care. The plea of mechanical ignorance which has been advanced on several occasions will not be accepted by me and district engineers who feel that they do not know enough about road rollers, etc., to know whether they are being properly operated and cared for or not, will take steps to acquire the necessary knowledge of these matters. If a district engineer is in doubt as to any details of care and maintenance such as the amount of oil and grease which should be used for moving parts, or the care of the boiler, etc., he should write this Bureau for information.

"Respectfully,

(Sgd.) "WARWICK GREENE,
Director of Public Works.

"The CHIEF DIVISION ENGINEER."
For the Director.

E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, August 8, 1913.

Provincial Division Circular No. 116.

SIR: Your attention is invited to the following excerpt from a circular letter of this Bureau issued under date of August 5, 1910:

"When returning property to the Bureau, the regular form for this purpose (B. P. W. No. 10, Check list of property returned) will be used giving the name of the person responsible for the property shipped, station, project or job number, means of shipment, bill of lading number, and property numbers corresponding with the memorandum receipt. This will enable our storekeeper to check the property correctly, make up Form No. 10 in like manner acknowledging receipt of the property and forward the original copy to the person concerned, who should file it with his duplicate copy of memorandum receipt.

"The storekeeper will send the duplicate receipt (Form No. 10) to the property division with the C-1 transfer slip attached where the memorandum receipt and property account will be credited accordingly."

The instructions contained in the above excerpt are still in force and will be carefully and strictly observed in returning any bureau property held by you on memorandum receipt. If you have no supply of this form (B. P. W. No. 10) on hand, a requisition for same should be promptly submitted.

For the Director.

E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

MANILA, August 19, 1913.

Provincial Division Circular No. 117.

SIR: Your attention is invited to the inclosed copy of Executive Bureau, Provincial Division Circular No. 34, giving instructions to provincial and municipal officials relative to the care and maintenance of artesian wells and pumps.

Inasmuch as one of the prime reasons for the large expenditure of public funds in the construction of artesian wells is to safeguard the public health through furnishing a pure and uncontaminated water supply, and in order that the purpose of this policy may not be rendered useless, and nullified through the wells lying idle on account of defective or broken pumps, you are directed to cooperate with the provincial and municipal authorities to the fullest and freest extent in maintaining the public pumps in a proper state of efficiency and to render them all the advice, information, and assistance possible.

For the Director.

E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.

"THE GOVERNMENT OF THE PHILIPPINE ISLANDS,
"EXECUTIVE BUREAU.

"Provincial Circular No. 34.

"Subject: Artesian wells and pumps—Maintenance of.

"MANILA, June 23, 1913.

"The attention of this Office has been drawn to the unsatisfactory conditions which prevail in regard to the care and maintenance of artesian wells and pumps. It frequently occurs that pumps, after being installed, become unserviceable for considerable periods of time for the lack of small repairs, which nobody considers it his duty to make, and for which, in some cases, no funds have been provided.

"The responsibility for the maintenance of artesian wells and pumps will hereafter devolve upon the provincial or upon a municipal government, according to whether the well or pump is situated upon provincial or municipal property. In all cases, sufficient funds to maintain every pump should be set aside in the annual estimate. It should be borne in mind that, even with the best of care, a mechanism receiving the constant hard usage to which a public pump is subjected, will require that it be renewed from time to time. Provision for the purchase of new pumps should also be made whenever it is apparent that new pumps are needed. It is obviously impossible to lay down any general rule as to how often new pumps should be installed. The principle governing this, as well as the matter of repairs, is that in no case should the benefits resulting from the investment of hundreds, and sometimes of thousands, of pesos in the drilling of an artesian well be lost through the failure of the proper governmental authorities to expend a relatively small amount for the repair of a pump or the purchase of a new one.

"Pumps being provincial or municipal property, the duty of seeing that they are kept in a condition of efficiency devolves upon the provincial and municipal treasurers. In regard to municipal pumps, municipal police, members of the municipal council, and all officers and employees of the municipality should immediately notify the municipal treasurer whenever any pump in the municipality is in need of attention. The municipal treasurer should also take any other necessary measures to keep himself informed of the condition of municipal pumps. Whenever it comes to his knowledge that any pump is in need of repair, he should immediately take steps to have the repairs made locally, if that be possible; if not, he should notify the provincial treasurer, who, either directly or through the district engineer, will take immediate steps to have the needed repairs made or a new pump supplied to the municipality. The provincial treasurers will render a bill to the municipality for the services of any provincial employee used on the repair of municipal pumps and for any supplies or equipment furnished.

"The making of local repairs will be greatly facilitated if the municipal treasurers have a suitable supply of wrenches, valves, etc. These may be obtained by requisition on the provincial treasurer, or on the Bureau of Supply. A pamphlet of instructions as to the care of a pump, explaining its mechanism and the method of making small repairs, has been issued by the Bureau of Public Works, and should greatly aid municipal treasurers in the making of minor repairs locally.

"Provincial treasurers should keep spare parts for the pumps in use in their respective provinces, as well as one or more extra pumps with the necessary suction pipes, etc., which could be installed without delay in case it be found that a new pump is needed in any municipality. Arrangements can usually be made with the district engineer for the use of one of his employees who has some mechanical training, whenever work in connection with the installation or repair of pumps has to be done.

"Responsibility for the maintenance of all pumps having now been definitely fixed upon provincial and municipal treasurers, they will be held answerable for any neglect that may be reported.

"The instructions herein contained supersede all other instructions of this Office upon the subject discussed.

"Provincial treasurers will transmit the contents hereof to the municipal officials concerned in accordance with the provisions of Provincial Circular No. 5.

"For the Executive Secretary.

(Sgd.) "W. A. RANDALL,
"Acting Special Agent."

To all PROVINCIAL BOARDS.

PROVINCIAL TREASURERS.

(Provinces organized under the Provincial Government Act.)

MANILA, August 20, 1913.

Provincial Division Circular No. 118.

SIR: Supplementary to our letter dated December 7, 1910, containing an agreement signed by C. M. Cotterman, Director of Posts, and C. E. Gordon, division engineer of the Bureau of Public Works, on behalf of the Director of Public Works, in relationship to the location of telegraph and telephone poles on public roads, the subjoined quotation from a procedure established by the Director of

Public Works and approved by the Director of Posts is submitted for your information and guidance:

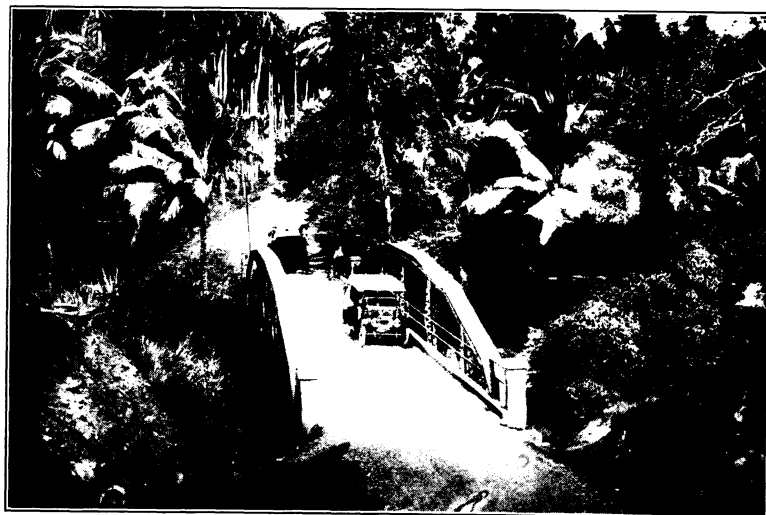
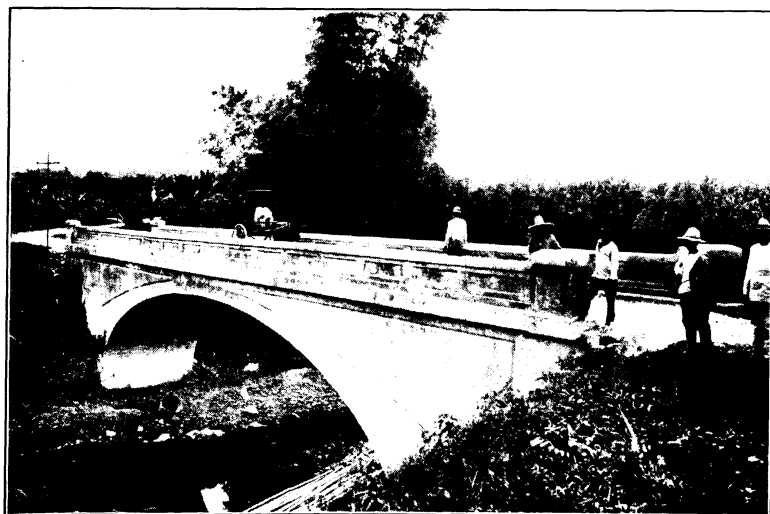
"Where telegraph poles have been placed on a trail or old road right of way, and where the full right of way width is now being reclaimed and the road is in the course of construction or reconstruction, if the Director of Posts will issue instructions to the local linemen to be prepared to supervise the work of realigning the telegraph poles at the time the road forces are actually employed on the road work, that then the road laborers will assist in removing the telegraph poles in accordance with the locations as usually agreed upon by the two bureaus."

This procedure applies, of course, only to the conditions above set out. On all roads where the full width of right of way has been regained and it is necessary to relocate or reestablish telegraph or telephone poles, the cost will be upon the branch of the Insular Government directly concerned, and not upon the Bureau of Public Works or the provincial governments.

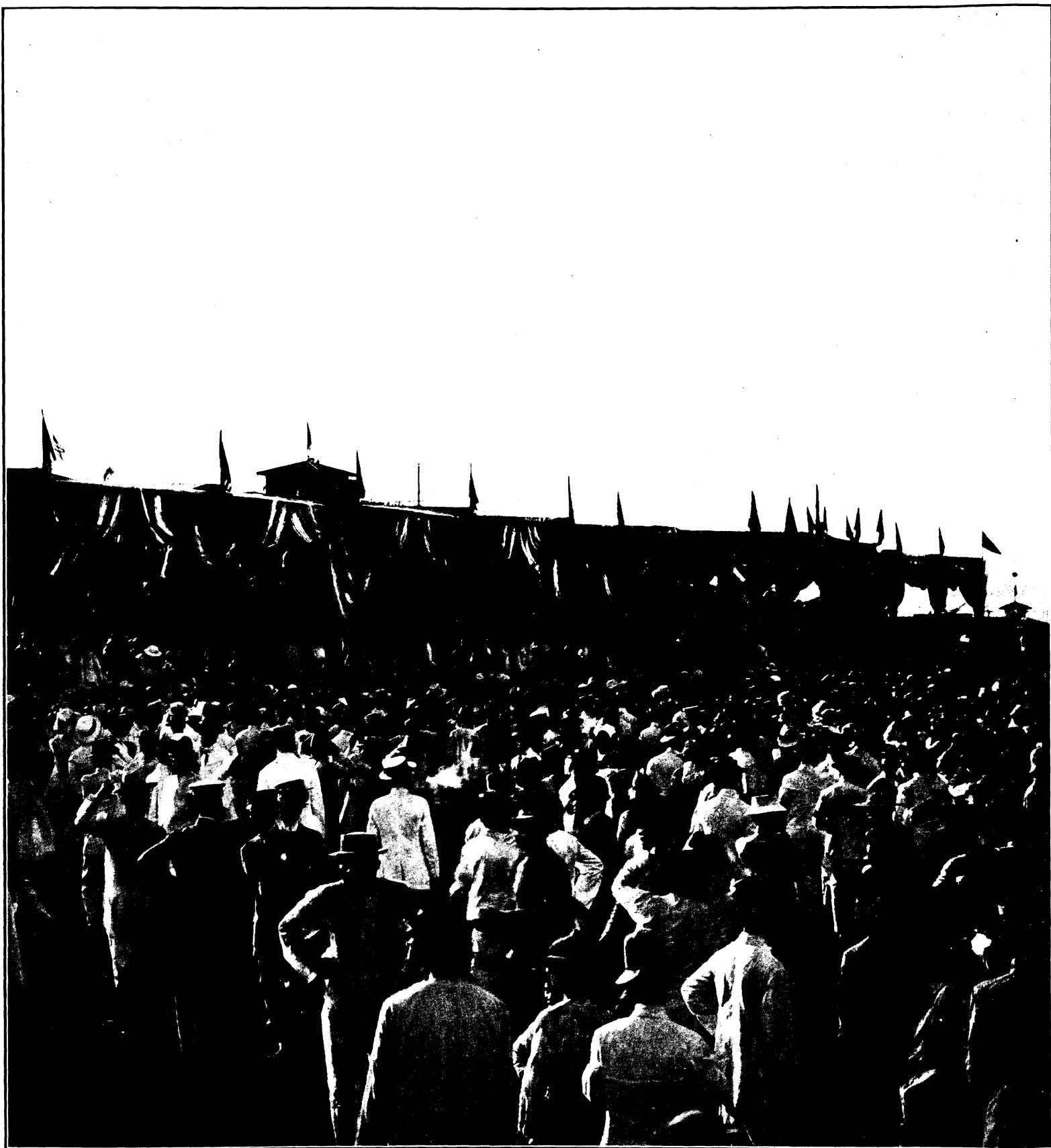
For the Director.

E. J. WESTERHOUSE,
Chief Division Engineer.

To all DISTRICT ENGINEERS and
DIVISION ENGINEERS.



Sections of the Manila South Road in Tayabas Province. The full length of this road was covered by Governor-General Harrison and party on their recent inspection trip through Tayabas Province. Total distance traveled, approximately 400 kilometers.



The Luneta stand built by the Bureau of Public Works to receive Governor-General Harrison. Taken at the time of his arrival on the stand.

APPENDIX C.

PROJECTS ACTIVE JULY 1, 1913.

Provinces.	Roads.				Bridges and culverts.				Provincial administration buildings.			Municipal administration buildings.		Prisons.		Schools.				Construction and operation.										Total.
	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair.	Reconstruction.	Construction.	Maintenance.	Repair and alteration.	Construction.	Reconstruction.	Construction.	Repair and alteration.	Construction.	Maintenance.	Repair and alteration.	Reconstruction.	Markets.	Parks, grounds, and athletic fields.	Miscellaneous buildings.	Ferries.	Water systems.	Record vaults.	Quarries.	Telephone lines.	Electric light plant.	Miscellaneous.	
Albay	3	2		1	2	2		1		1		2				2	1			7									4	28
Ambos Camarines	1	2		2	2	1															1								1	19
Antique	3	2		1	2					1						2	1												1	13
Bataan	1	2			1																			1						5
Batangas	2	4			2						1					3	2			2									2	18
Bohol	2	3	1		13											2			1	2		1		3					1	27
Bulacan	5	3	1		10											2	1			1									2	25
Cagayan	2	3			2	1				1			1	1	1	1	1			1	2		1					4	18	
Capiz	4	1		3	1															1										14
Cavite	4	2			1											5			1				1							13
Cebu	7	2				1				1						4				6	1			1					2	25
Ilocos Norte	1	2			3			1			1					7		3											3	20
Ilocos Sur	5	3	1		2	1							1			9							1	1					3	27
Iloilo	3	3		2	7											2				2		1		1					1	22
Isabela	2	2			3											1														8
Laguna	3	3	2	4				1								8				3	1					1	2		1	29
La Union	4	3			4											1													2	19
Leyte	1	1			5	1			1	1						6	2				1									19
Misamis	4	3		1	6											1														16
Nueva Ecija	2	2			3											8				1	1		1	1					1	20
Occidental Negros	6	2		3	5											1				2			1						1	21
Oriental Negros	2	4			1				1							3												1	3	14
Pampanga	1	3														1														13
Pangasinan	4	3		3	7			1				1	2	1	1	11		1	1	3			1	1					2	42
Rizal	10	13						1																					3	26
Samar	5	2														1						1		1					3	13
Sorsogon	3	2			2	2										2													4	15
Surigao	2	2														5		2												11
Tarlac	1	3			5											4				1									2	16
Tayabas	4	3			2					1		1				3					1			1					1	17
Zambales		1			6											1								1					2	12
Total	95	93	5	20	97	9		5	2	8	1	4	4	2		102	7	7	3	33	8	4	6	12		1	3	1	53	585

The 53 miscellaneous projects shown hereon represent 16 surveys and investigations, 4 dikes, 2 river controls, 2 fence constructions, 1 bituminous road, etc.

BUREAU OF PUBLIC WORKS

ORGANIZATION

WARWICK GREENE, <i>Director</i>	J. L. VICKERS, <i>Superintendent Artesian Wells Division</i>
C. LINDSEY, <i>Assistant to the Director</i>	MAX DOBBINS, <i>Statistical Engineer</i>
C. W. HUBBELL, <i>Chief Engineer.</i>	J. K. PICKERING, <i>Chief Accountant</i>
W. L. GORTON, <i>Chief Irrigation Engineer</i>	O. K. OLSON, <i>Property Clerk.</i>
C. W. KEITH, <i>Chief, Division of Engineering Design</i>	H. M. JOHNSTON, <i>In charge of Record Division</i>
W. M. HAUBE (absent), <i>Superintendent Special Projects</i>	A. K. JONES, <i>Law Clerk</i>
J. MCGREGOR, <i>Chief, Building Division</i>	Mrs. R. D. BENDER, <i>In charge of Library</i>
L. L. COOK, <i>Superintendent Automobile Division, Manila</i>	

PROVINCIAL DIVISION

E. J. WESTERHOUSE, *Chief Division Engineer*

DIVISION ENGINEERS

FIRST DIVISION D. E. HENRY (acting) THIRD DIVISION W. H. WAUGH

PROVINCES

Cagayan	Ilocos Sur	Nueva Ecija
Isabela	Zambales	Pangasinan
Ilocos Norte	La Union	Tarlac

PROVINCES

Cebu	Oriental Negros
Iloilo	
Occidental Negros	

SECOND DIVISION C. E. GORDON

PROVINCES

Bataan	Cavite	Rizal
Batangas	Laguna	Tayabas
Bulacan	Pampanga	

FOURTH DIVISION B. VON SCHMELING

PROVINCES

Albay	Misamis	Sorsogon
Ambos Camarines	Samar	
Leyte	Surigao	

DISTRICT ENGINEERS

Barry, R. L.....	Tuguegarao, Cagayan	Miles, H. V.....	Lucena, Tayabas
Baluyot, Sotero.....	Ilagan, Isabela	Agcaoili, Romarico.....	San Jose, Antique
Root, W. F.....	Laoag, Ilocos Norte	Bogges, L. S.....	Tagbilaran, Bohol
Smith, E. D.....	Vigan, Ilocos Sur	Scheidemantel, L. W....	Capiz, Capiz
White, R. A.....	San Fernando, La Union	Russell, Claud.....	Cebu, Cebu
Austin, A. W.....	Cabanatuan, Nueva Ecija	Glenn, R. V.....	Iloilo, Iloilo
Morrison, C. G.....	Lingayen, Pangasinan	Sylvester, A. T.....	Bacolod, Occidental Negros
Brown, E. C.....	Tarlac, Tarlac	Grosvenor, I. R.....	Dumaguete, Orient. Negros
Kasilag, Marcial.....	San Narciso, Zambales	Marshall, J. T.....	Albay, Albay
Vallarta, Julian.....	Balaña, Bataan	Dandois, Chas. S.....	Nueva Caceres, Ambos Ca-
Caton, J. H. 3rd.....	Batangas, Batangas		marines
Harrison, J. L.....	Malolos, Bulacan	Clark, L. T.....	Tacloban, Leyte
Bennett, C. R.....	Cavite, Cavite	Allen, R. N.....	Cagayan, Misamis
Barry, J. R.....	Los Baños, Laguna	Cookingham, J. C.....	Catbalogan, Samar
Davis, H. K.....	San Fernando, Pampanga	Meehleib, H. R.....	Surigao, Surigao
Beckjard, J. G.....	Pasig, Rizal	Lilley, H. B.....	Sorsogon, Sorsogon